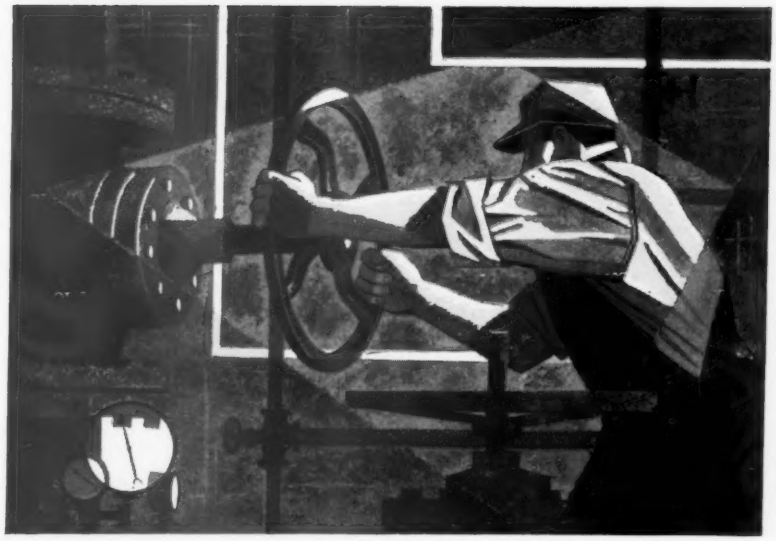
PAINT and VARNISH Production

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES

AUGUST
1959

0c per copy



Improved NEVILLE 2-50-W Hi-Flash Solvent brings you better finishes at lower cost

Neville's 2-50-W Hi-Flash Solvent has always been characterized as a superior, fully refined, water-white naphtha with a slow evaporation rate, good odor, high flash point and excellent solvency power. *Now, through improved control techniques, the solvency strength has been increased with no change in the product's low cost.*

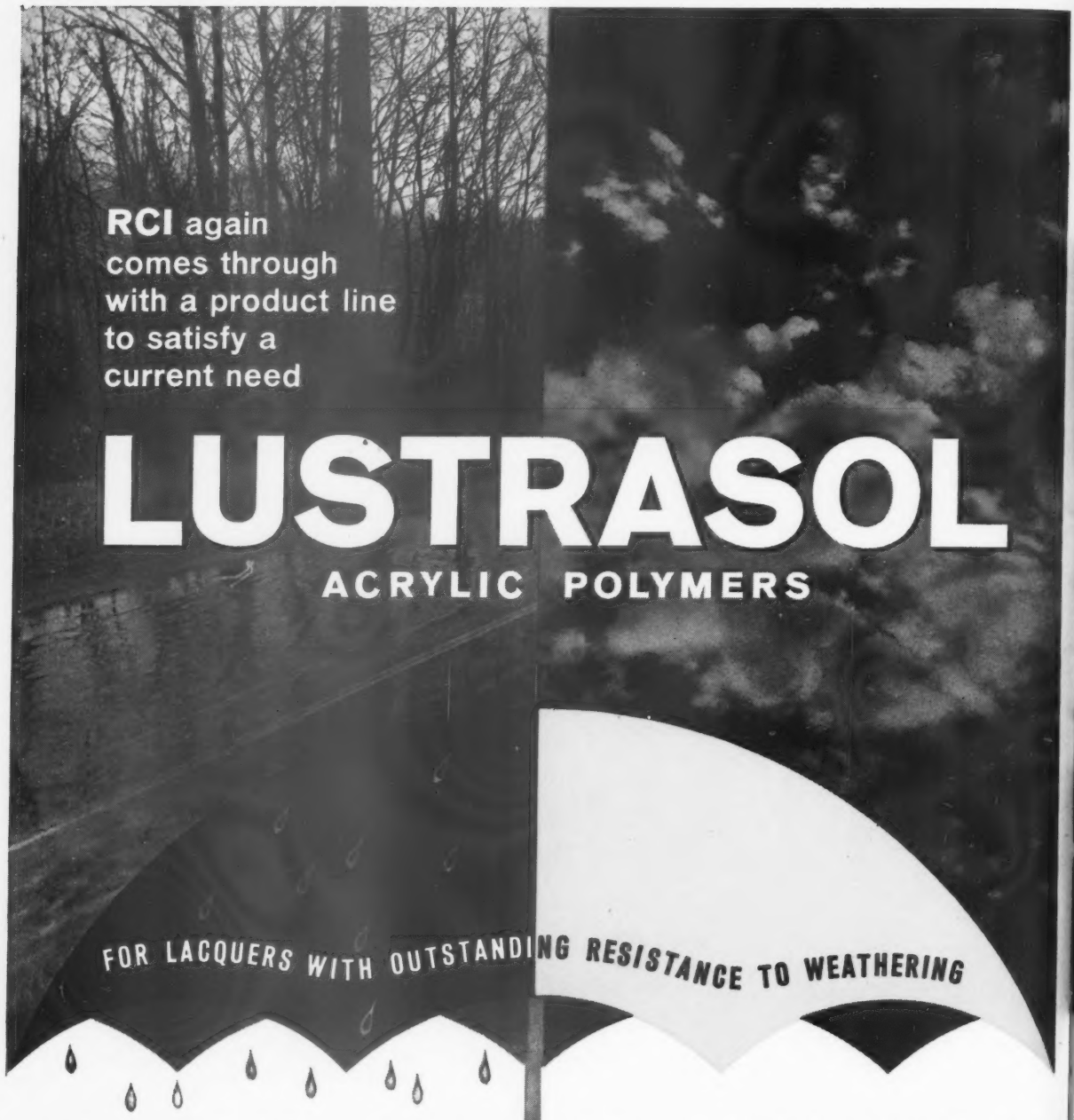
And beyond solvency power, 2-50-W offers a number of other advantages to the manufacturer of alkyd finishes, aluminum paints, marine finishes, varnishes and enamels. It leaves no gummy residue to soften a finish, aids adhesion, hardens uniformly, and improves brushing, flowing and leveling characteristics. It aids in promoting surface tension control when used in aluminum paints, thereby promoting better leafing and leaf retention. 2-50-W is available for quick delivery in drums, transports or tank cars. For further information or a sample, please write.

**Trade name*

NEVILLE®

Neville Chemical Company

Pittsburgh 25, Pa.



Reichhold now offers formulators two new acrylic resin solutions... LUSTRASOLS 4326 and 4328 ... for use as single vehicles with plasticizers in the production of high quality rubbing lacquers possessing maximum gloss retention under exterior exposure. RCI's LUSTRASOL solutions assure you (1) exceptional durability both in light colors and in metallics with high metal content; and (2) drying characteristics consistent with standard procedural requirements for nitrocellulose lacquers. Specification sheets, samples and starting formulae on request.

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RCI

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Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol • Hydrochloric Acid • Formaldehyde
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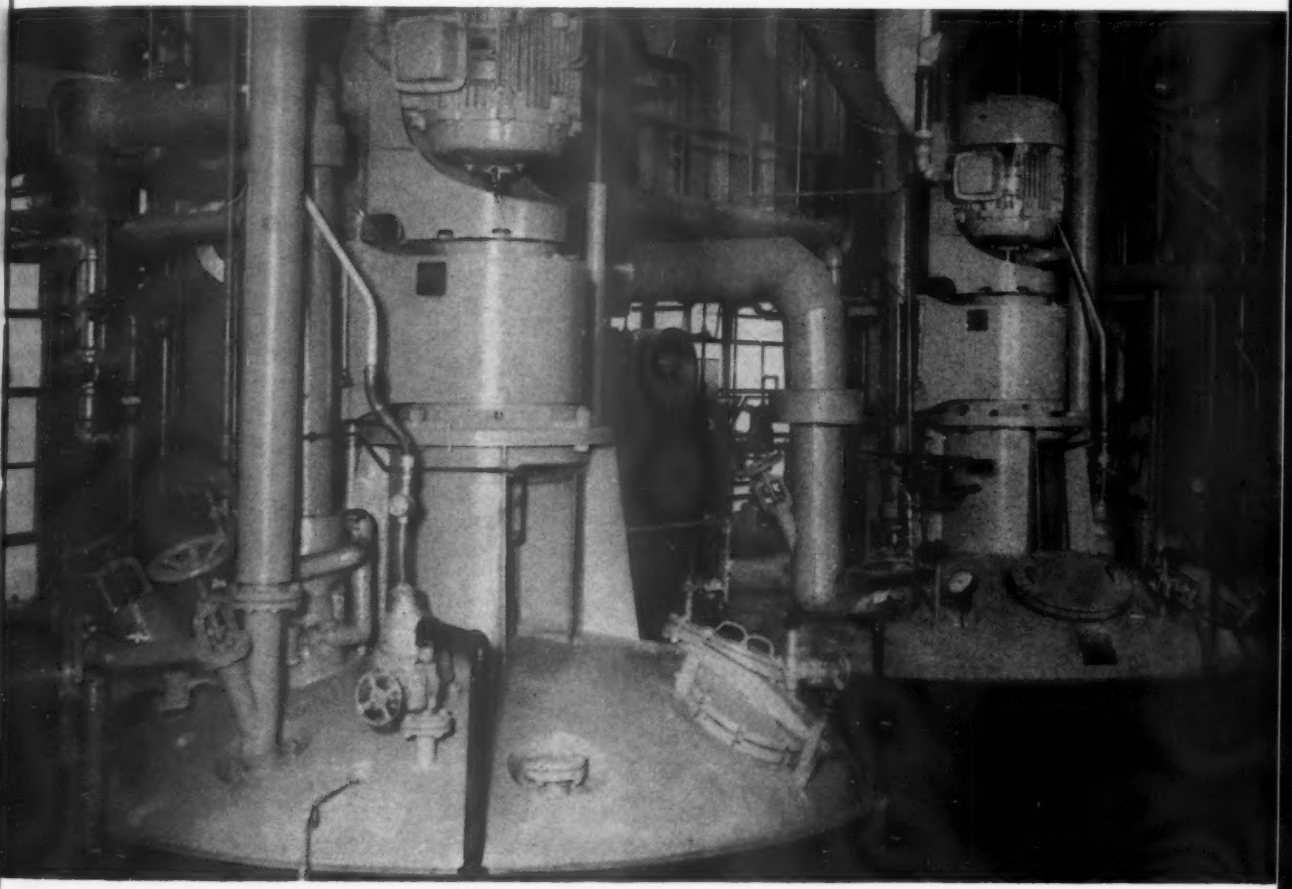
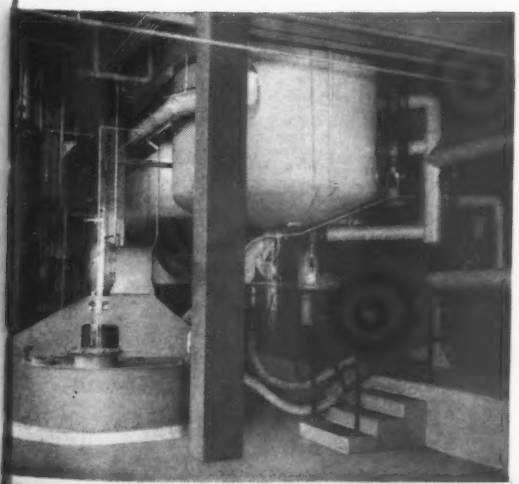
REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

HERE'S PUSHBUTTON VERSATILITY

in processing synthetic polymers for RINSHED-MASON at Detroit



Patterson SYNTHETIC RESIN SYSTEMS



In Rinshed-Mason's manufacture of the new high quality acrylic finishes for today's automobiles, Patterson synthetic resin processing equipment has a vital role. Pushbutton automatic from raw material feed to product discharge, the operation is controlled from a single panel. One common loop provides the hot liquid for heating four reactors. By means of individual recirculation systems, the jacket temperature of each reactor may be controlled precisely for operating between 100°F and 600°F. The installation, including 3 resin systems, a pilot plant, and all process piping, was furnished complete through start-up by Patterson. ● Let us show you what modern Patterson synthetic processing systems can do to improve profits in *your* operations. Write!

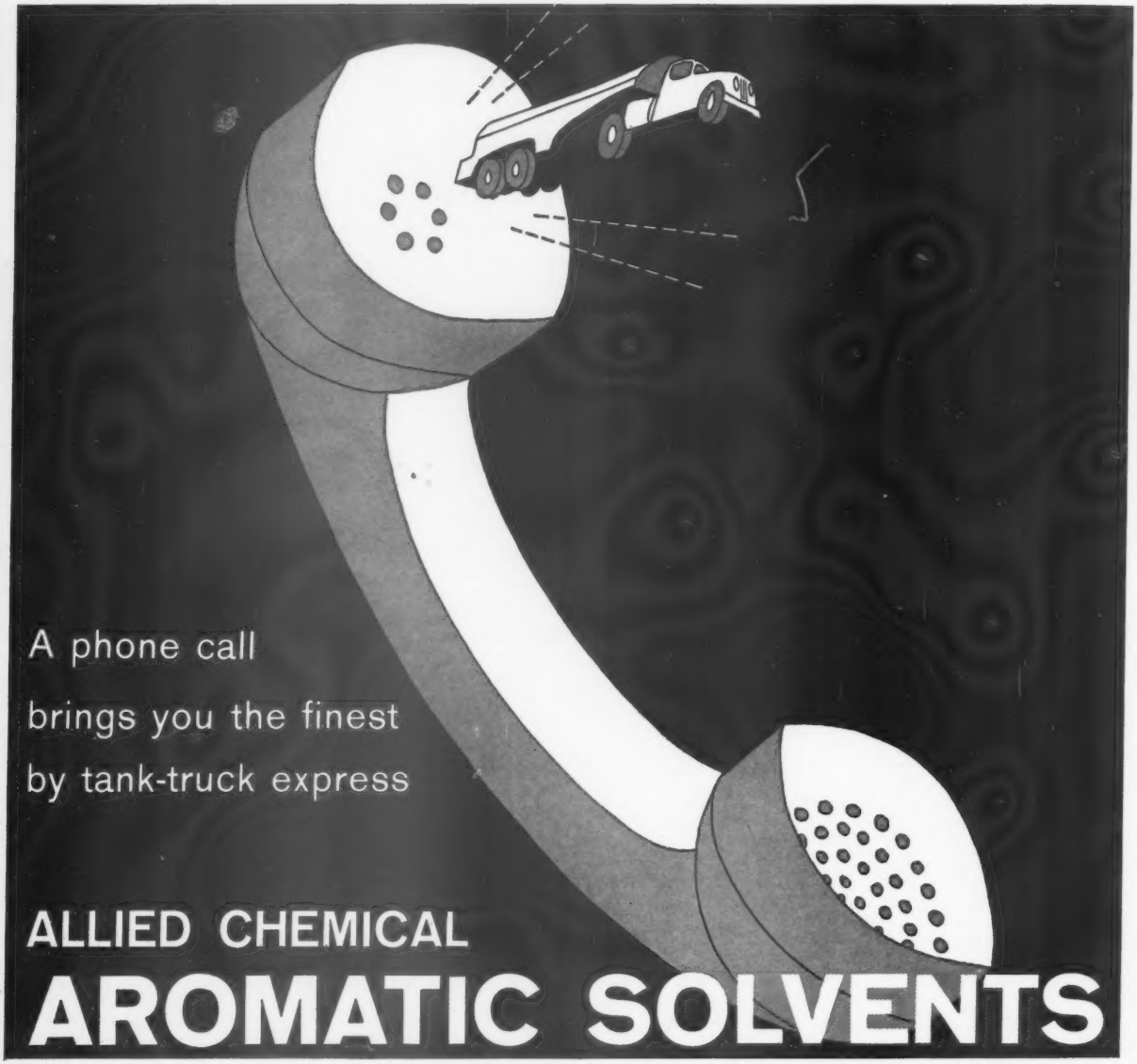
THE *Patterson* FOUNDRY AND MACHINE COMPANY

A Division of Ferro Corporation

East Liverpool, Ohio

THE *Patterson* FOUNDRY AND MACHINE CO. (CANADA) LTD.

Toronto, Ontario



ALLIED CHEMICAL
AROMATIC SOLVENTS

When you order from Allied Chemical, you get the finest in Aromatic Solvents and you get them quickly. For all grades of Benzol, Toluol, and Xylol and for Hi-Flash Solvent,* just phone in. If your plant is located within 50 or 60 miles of a city listed below, you'll get immediate delivery by qualified drivers in express tank-trucks specially equipped to handle solvents.

Allied Chemical's basic position, plus its pioneer role in standardizing testing methods and specifications for light oil distillates, assures you a stable supply of Aromatic Solvents of high reliability. As solvents, our Benzol, Toluol, and Xylol and Hi-Flash Solvent go into paints based on alkyd resins, polystyrene, pitch and chlorinated rubber. As diluents, Aromatic Solvents permit high dilution ratios in lacquers, acrylic ester polymers and vinyls.

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VOL. 49 AUGUST, 1959 NO. 9

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NEXT ISSUE

Control of pollutants from paint and varnish manufacturing operations will be featured in our September production section. Sources of atmospheric pollution and methods for controlling atmospheric emission will be covered in detail.

MEMBER BUSINESS BPA PUBLICATIONS AUDIT, INC.

EPON® 828 . . . from TOP to BOTTOM,

the recognized performance standard for liquid epoxies

Ever since its introduction a decade ago, Shell Epon 828 has set the pace as a uniform thermosetting plastic with a remarkably wide range of applications . . . from high-flying missiles to underground glass fiber pipe and pipe coatings. No other resin polymer combines such outstanding uniformity with *so many* other desirable properties.

A pourable liquid at room temperature, Epon 828 is a 100 per cent reactive resin that gives unexcelled performance in wet lay-up laminating of glass fiber, in potting and encapsulating electronic components, in casting, and in surface coating. In adhesive formulations, Epon 828 makes extremely strong bonds with metal, wood, glass, and many plastics . . . stronger often than welds or rivets.

Epon 828 is used in the manufacture of many products, new and old, such as boats, tools and dies, aircraft, commercial adhesives, and vinyl stabilizers. It is a principal ingredient in surface coating formulations that give films of almost unparalleled resistance to abrasion, impact and the attack of solvents, alkalis, and acids. A new and fast-growing use is in industrial floor surfacing compounds.

* * *

The unequalled uniformity of Epon 828 assures formulators of this wide range of applications. Only Shell Chemical offers you a *complete* line of epoxies. Write to your nearest Shell Chemical district office.

Epon puts the power in plastics

SHELL CHEMICAL CORPORATION

PLASTICS AND RESINS DIVISION

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SHELL

EDITORIAL COMMENT

Industrials Gaining

ALL indications point to record sales for major appliances in 1959, according to Richard J. Sargent, vice president of Westinghouse and general manager of marketing and distribution of consumer products, who sees retail appliance sales topping the previous record of 1956 which was slightly over $8 billion.

"For the first five months of 1959, distributor sales to dealers of refrigerators, freezers, electric ranges, and home laundry equipment ran 19.5% ahead of the same period in 1958," Mr. Sargent said in a recent press conference held at Chicago's Merchandise Mart.

This spurt in appliance production plus similar increases in automobile, television, and phonograph production is being reflected in increasing sales of industrial finishes. Recent figures released by the Bureau of Census show industrial sales for the first four months of 1959 surging ahead of the same 1958 period by 16.8% It is also interesting to note that industrial sales in April amounted to $67,700,000 which established a new record high for any month in the industry's history. Moreover, this volume represents a gain of 7.5% over March and 27.8% over April, 1958.

From the foregoing and, of course, barring any prolonged steel strike, we can expect continued strong demands for industrial finishes during the months ahead.

Aerosols and Marbles

MARBLES, ordinary playthings for youngsters, are finding an important application in aerosol paint cans, reports the American Can Company. They act as internal agitators and help stir up the paint.

Unlike regular canned paints which require mixing by hand, aerosol paints, packed in sealed, pressurized cans, can be mixed only by the consumer's shaking the can. The marble breaks up pigment which may have settled between uses, and rattles freely in the can when the paint is well mixed.

Krylon, Inc., users of more than 20 million marbles a year, explained that glass marbles are preferred over ball bearings because the marbles are more sterile, can't corrode as steel might, and are a good deal less expensive than ball bearings.

With the dying sport of marble playing, marble manufacturers can now look toward a brighter horizon of a booming aerosol market.

Banner Year in the Making

ONE of the big factors in the construction picture for 1959 has been housing. Residential building contracts in May totalled $1,677,324,000, up 25 percent over the May, 1958 level. However, sharp gains in contracts for manufacturing and commercial building in the past several months reflect growing business optimism and indicate increased activity in these vital sectors in the months ahead, according to F. W. Dodge Corporation.

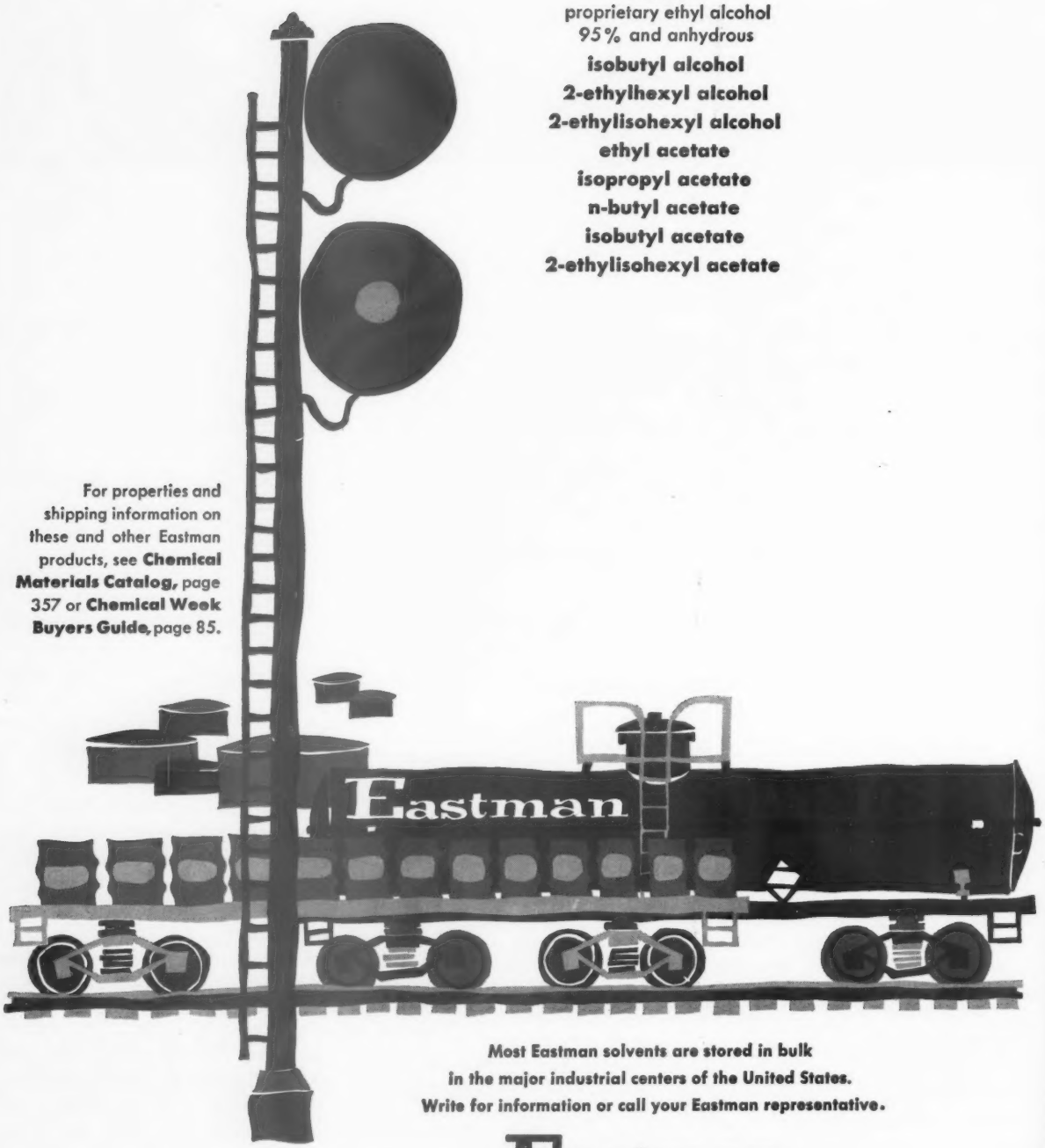
Cumulative totals of contracts for the first five months of 1959, with percentage changes from the comparable 1958 period, were as follows: nonresidential building at $4,669,710,000, up 3 percent; residential building at $7,126,054,000, up 39 percent; heavy engineering at $3,434,570,000, up 4 percent; and total construction at $15,230,334,000, up 17 percent.

At this pace, it is quite likely that 1959 will go down as the best year for construction in this country's history.

Eastman Solvents

acetone
ethyl alcohol
Tecsol®
proprietary ethyl alcohol
95% and anhydrous
isobutyl alcohol
2-ethylhexyl alcohol
2-ethylisohexyl alcohol
ethyl acetate
isopropyl acetate
n-butyl acetate
isobutyl acetate
2-ethylisohexyl acetate

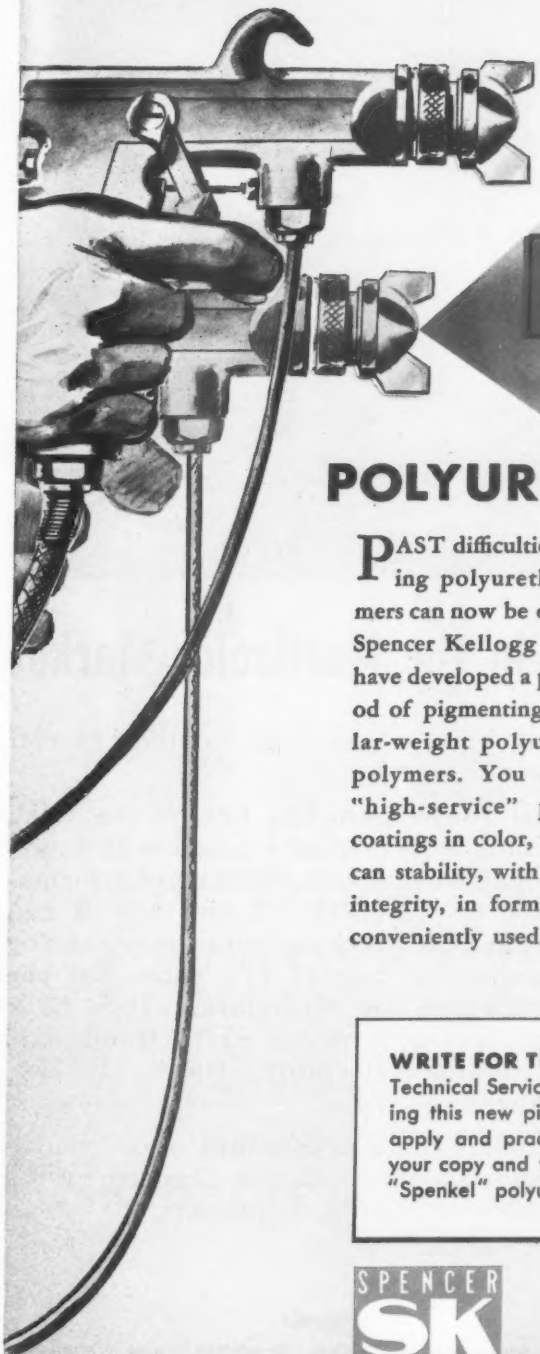
For properties and shipping information on these and other Eastman products, see **Chemical Materials Catalog,** page 357 or **Chemical Week Buyers Guide,** page 85.



Most Eastman solvents are stored in bulk in the major industrial centers of the United States. Write for information or call your Eastman representative.

Eastman
CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE
subsidiary of Eastman Kodak Company

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Chicago; Cincinnati; Cleveland; Framingham, Massachusetts; Greensboro, N. C.; Houston; New York City; St. Louis. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.



NOW YOU can produce PIGMENTED pre-polymer type POLYURETHANE COATINGS

PAST difficulties of pigmenting polyurethane pre-polymers can now be overcome. The Spencer Kellogg Laboratories have developed a practical method of pigmenting high-molecular-weight polyurethane pre-polymers. You can produce "high-service" polyurethane coatings in color, with excellent can stability, with excellent film integrity, in forms that can be conveniently used. Gassing and gelation in the container will be eliminated as well as pinholing in the film.

Higher gloss and better application properties will accompany improved viscosity stability.

This method specifically deals with Spenkels P18-50X and P93-80X—both urethane pre-polymers that exhibit high chemical and wear resistance. Spenkel P18 is very hard. Spenkel P93 is extremely flexible. Both are tough. *NOW* they can be pigmented.

WRITE FOR THIS BULLETIN. Spencer Kellogg and Sons, Inc. Technical Service Department have prepared a bulletin describing this new pigmentation method, showing it to be simple to apply and practicable for the average paint plant. Write for your copy and for the bulletins describing the Spencer Kellogg "Spenkel" polyurethane intermediates.

SPENCER SK KELLOGG

SPENCER KELLOGG AND SONS
INCORPORATED
BUFFALO 5, N. Y.

SPENCER KELLOGG AND SONS, INC.
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Please send me the bulletin on your "Slurry Grind" method of pigmenting polyurethane intermediates.

NAME_____
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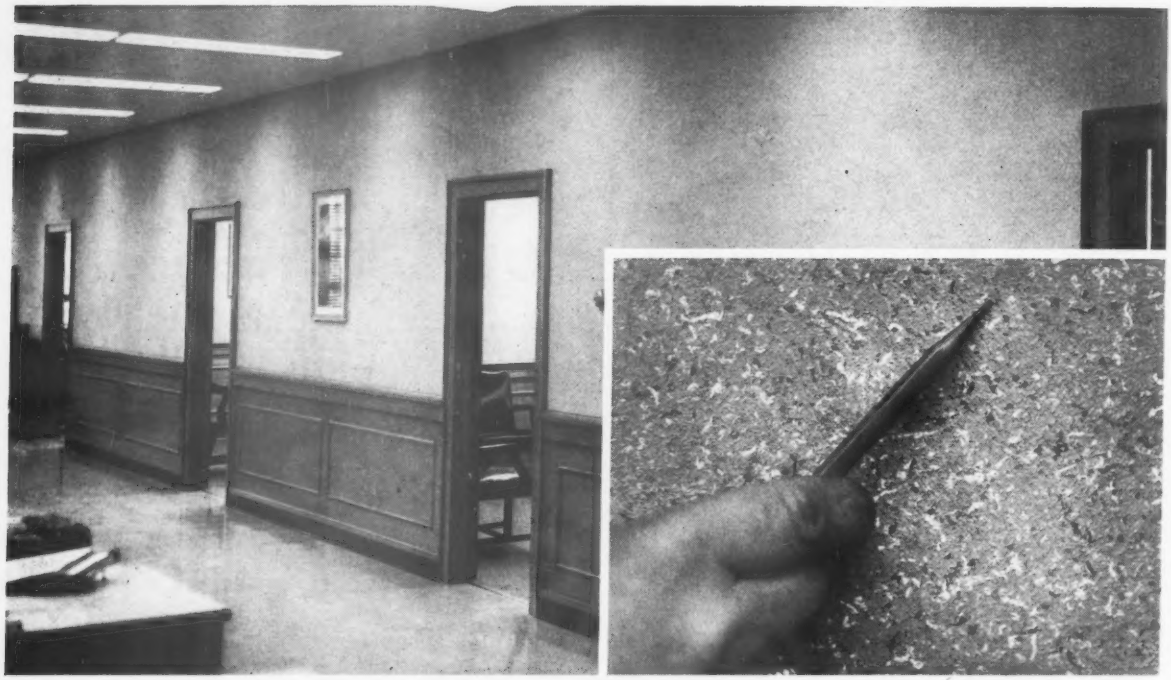
PVP-8



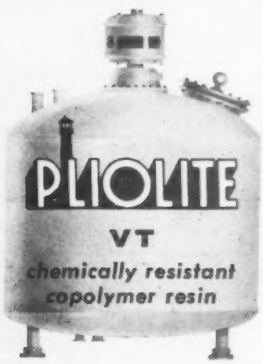
How to Multiply Your Chances in the Multicolor Market

Already a "hot item," multicolor finishes are fast becoming even more popular. This means that the paint maker who can produce *truly outstanding* multicolor finishes can multiply his chances of capturing a handsome share of what is sure to become a big and bountiful market.

One resin offers the advantages that make possible multicolor finishes of superior quality. Its name: PLIOLITE VT. Its advantages: Lower odor level (and it's a mild, pleasant odor). Greater safety in manufacture and use. Far greater hiding power. No lifting of the base coat (and no *special* primers needed).

All these benefits are yours with PLIOLITE VT—plus a possible 80% saving in solvent cost. Want more information on PLIOLITE VT and how it can help you increase your market for multicolor paints? It's yours for the asking, along with latest *Tech Book Bulletins*. Simply write Goodyear, Chemical Division, Dept. H-9450, Akron 16, Ohio.

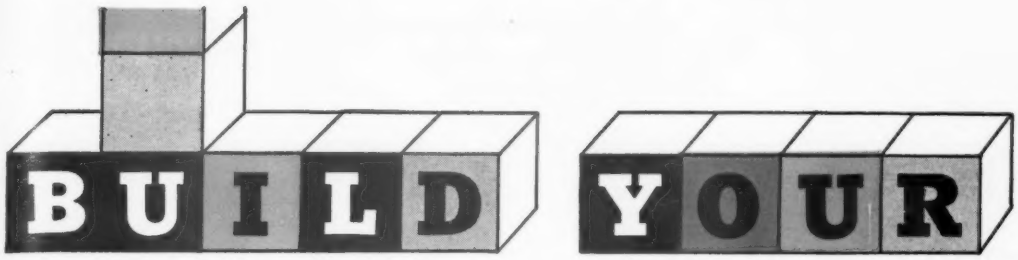
Note: The manufacture of all multicolor finishes must be licensed by the holder of the basic patents.



GOODYEAR

CHEMICAL DIVISION

Pliolite—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



LEAD-FREE COLOR BUSINESS

For Trade Sales—Toy Finishes Requiring Non-Toxic Pigments

ASK YOUR KENTUCKY COLOR SALES REPRESENTATIVE *ABOUT LEAD-FREE COLORS!*

- **HANSAS**
- **BENZIDINES**
- **DINITRO-ORANGE**
- **PIGMENT-GREEN-B**
- **ORGANIC REDS, GREENS, BLUES**

Write Technical Service Dept. For Complete Information

OR

Write for Bulletin #32, the new Kentucky Color & Chemical Company's Lead-Free Color Bulletin, containing basic information on lead-free color systems.

Kentucky Color

AND CHEMICAL COMPANY, INC.

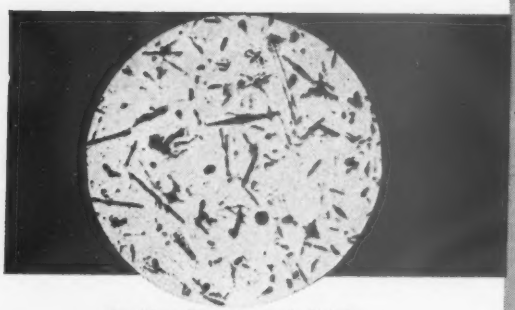
Subsidiary of

The Harshaw Chemical Company

Louisville 12, Kentucky

AZO

acicular ZINC OXIDE gives paint Extra durability



For High Consistency in Paints
AZO ZZZ-22

For Medium Consistency in Paints
AZO ZZZ-11

For Low Consistency in Paints
AZO ZZZ-33

Forty years ago, American Zinc produced the original acicular lead-free zinc oxide that received wide acceptance by the paint industry and led the way over the years to improved durability from zinc oxide in exterior paints. AZO acicular zinc oxides are available over a wide range of oil absorptions to give you the required paint consistency.

AZO acicular zinc oxides are free from detrimental colloidal fines, produce exceptional weathering properties in exterior paints, and are resistant to hard settling during shelf storage. For general use in the production of paints and enamels.

ALL AZO PAINT GRADE ZINC OXIDES AVAILABLE AS AZODOX (De-Aerated)

AZODOX has twice the apparent density, half the dry bulk. Faster handling, easier storing, quicker mixing.

1ST

American Zinc was the first, *and is still the only* producer of acicular lead-free zinc oxides covering a wide range of oil absorptions from high to low *and including the intermediate ranges.*

American Zinc sales company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY
COLUMBUS, OHIO • CHICAGO • ST. LOUIS • NEW YORK

DOW | **EPOXY RESINS**

TIGHT QUALITY CONTROLS keep Dow Epoxy Resins unmatched for uniformity

As a basic producer of fine epoxy raw materials, Dow can maintain tight quality controls *throughout the production process.* These exact and extensive controls from start to finish result in many benefits, including these three: A narrower range of specifications means you, the paint manufacturer, get a clear, gel-free resin *every time.* Then there's the low salt content and lack of impurities that contribute to over-all film integrity for the most exacting applications. Third, is the exceptional uniformity for which Dow Epoxy Resins are well known among paint manufacturers. These premium-grade, almost colorless resins (with no increase in price) are free-flowing and easy to handle with complete cold-cut solubility.

Why not let the new Dow Epoxy Resins make an extra profit for you? Get informative technical data on both Dow Solid and Dow Liquid Epoxy Resins from your local Dow sales office. Or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Coatings Sales Department 2365DL8.

THE DOW CHEMICAL COMPANY · MIDLAND, MICHIGAN

DOW | **FIELD TESTS expose potential profit-maker**

Dow's development of a new acrylic latex as a binder for exterior wood paints has become a matter of profit-interest to the paint industry. The successful adaptation of this new material to exterior house paints would provide a basis for the manufacture of completely new types of products and generate new profits. This is the latest report to the industry on Dow's progress on acrylic latex over wood.

NEW DOW ACRYLIC LATEX EXCELS IN EXTERIOR WOOD EXPOSURE TESTS

20-month field test gives acrylic latex high rating on film integrity, excellent rating on color retention

Extreme close-up of overlap area after 20 months exposure. Paints were applied over 3 year old medium-to-heavy chalked oil paint. Paint with Dow Latex 2647 (right) shows equal adhesion, and freedom from blistering and peeling, compared to Oil Paint Control (left).

Comparative color retention is clearly seen. Color loss in the Oil Paint Control became noticeable after six months exposure and continued to increase up to the present time. Dow Latex 2647 shows NO color loss after 20 months.

AFTER 20 MONTHS EXPOSURE: Previous finish was oil paint, medium-to-heavy chalk. Side of garage—Oil Paint Control. Siding around door—Dow Latex 2647. Both paints show excellent adhesion with no film failure. Oil Control shows considerable color loss. Dow Latex 2647 shows NO color loss.

AFTER 21 MONTHS EXPOSURE: Dow Latex 2647 Paint (bottom boards), and Alkyd Control (top boards) over badly weathered and chalked oil paint. Both films have excellent adhesion, no film failure. Alkyd Control, appreciable color loss. Dow Latex 2647, NO color loss.

Preliminary results from panel exposure testing of Dow Latex 2647 were promising—so promising that a home exposure program was begun.

The accompanying photographs show results after 20 months of exposure, including two severe winters. In our tests, we found film integrity of the exposed Dow Latex 2647 paint matched that of commercial oil and alkyd controls, and surpassed both controls in color retention.

In addition to indications of durability over exterior wood surfaces, paints formulated with Dow Latex 2647 exhibit application advantages similar to those of interior latex paints. They are easy to brush and roll, they dry quickly, they can be recoated quickly, and equipment can be cleaned using only soap and water.

In short, Dow tests indicate that exterior wood finishes with Dow Latex 2647 have numerous advantages, particularly color retention and blister resistance. Samples of Dow Latex 2647 are available to manufacturers who wish to begin experimental formulation. For information, write THE DOW CHEMICAL COMPANY, Midland, Michigan, Department 2314DL8, or contact the Dow sales office nearest you.

Modern floor paints provide years of service when formulated with Dow Latex.

LATEX FLOOR PAINT

. . . Down-to-earth durability

Dow's advances in latex chemistry have benefited many other paint products, too. Time was when the painting of concrete floors was a major problem. Soap and abrasion and the alkali in the concrete were serious threats to durability. Today, when Dow Latex is used as binder, modern concrete floor paints stay bright and colorful.

Modern latex floor paints have built-in consumer appeal, too. They apply easily, dry quickly, clean-up simply, reduce dusting.

Specify
DOW PAINT MATERIALS
for your formulations

Dow Latex 512K
Dow Latex 762W
Dow Latex 512L • Dow Latex 762L
Dow Latex 566 • Dow Epoxy Resins
Ethocel® • Bisphenol A
Methocel® • Methylene Chloride
Dowicide® • Epichlorohydrin
p,p'-Methylenedianiline • Glycerine
Glycols • Dowanol® • Dowtherm®
Saran Latex F-122-A20
Saran Resins • Styrene
Vinyltoluene • Divinylbenzene
alpha-Methylstyrene
Dow Resins 276V2, 276V9

THE DOW CHEMICAL COMPANY
Midland, Michigan

DOW

NEW CARGILL POLYURETHANE 1210

A HIGHLY SUITABLE VEHICLE FOR INDUSTRIAL APPLICATIONS

These properties of newly-marketed Cargill Polyurethane 1210 make it an especially suitable vehicle in the formulation of such industrial finishes as automotive and appliance primers, one-coat industrial enamels where outstanding toughness or chemical resistance is required, clear furniture varnishes and similar applications.

Speed of dry . . . . . tack free in 30 minutes

Hardness . . . . . pencil hardness of H after 4 days, air dry

Impact resistance . . . . 160 inch/lbs for both air dry and bake

Flexibility . . . . . withstands bending over ⅛ inch mandrel

Adhesion . . . . . tape test on tin-plate, excellent

Water and chemical resistance . . . . bake: distilled water, 100°F, 1 week, excellent
bake: gasoline, 1 week, excellent

Salt-spray resistance . . . 20% salt spray, 300 hours, no blisters, no creep

Abrasion resistance . . . . . 61 liters of sand to failure, falling sand method

Polyurethane 1210 is a product of Cargill research. For specifications, suggested formulation or uses, write or wire today to:

Cargill, incorporated

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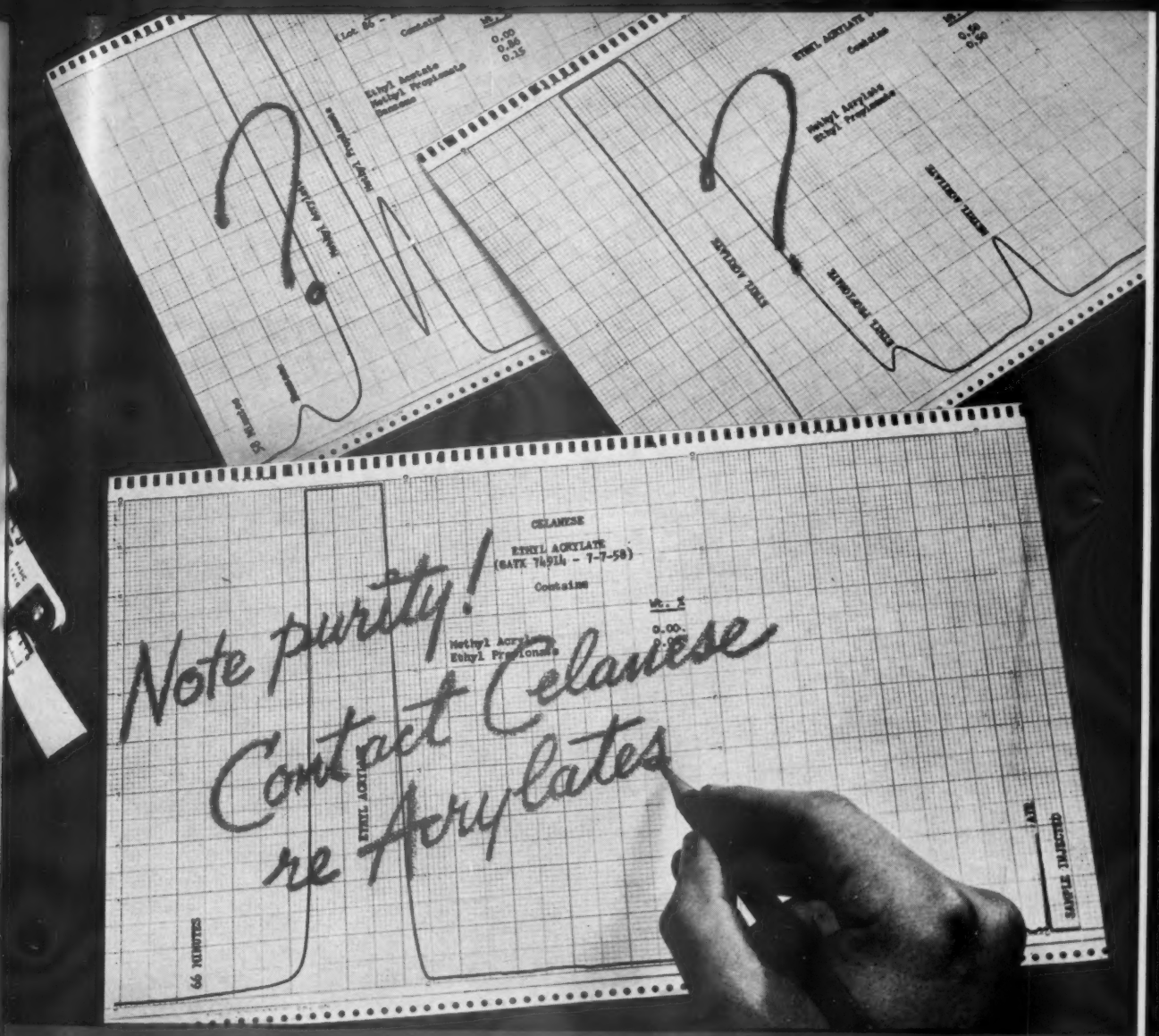

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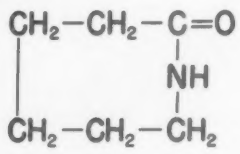
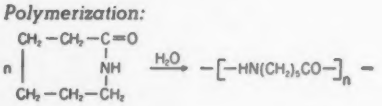


Polymerization:



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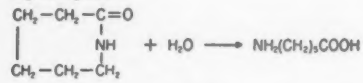
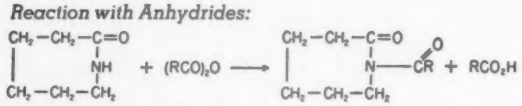
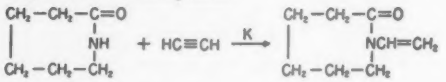


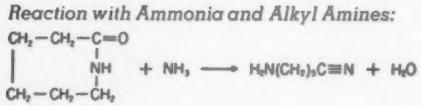
Reaction with Anhydrides:



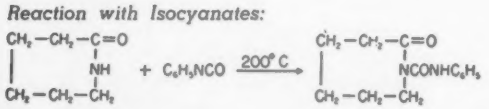
Reaction with Acetylene:



Reaction with Ammonia and Alkyl Amines:



Reaction with Isocyanates:



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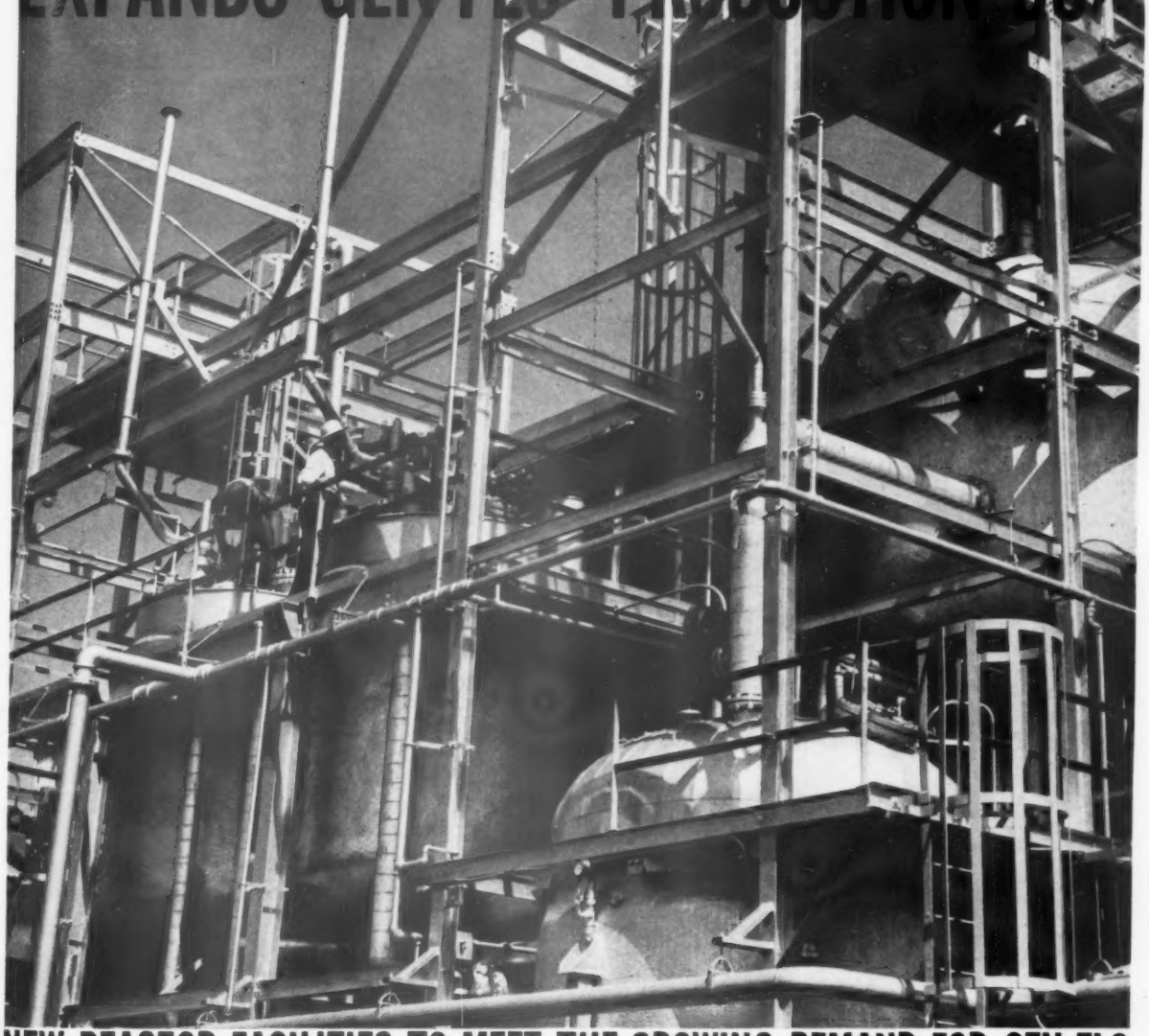

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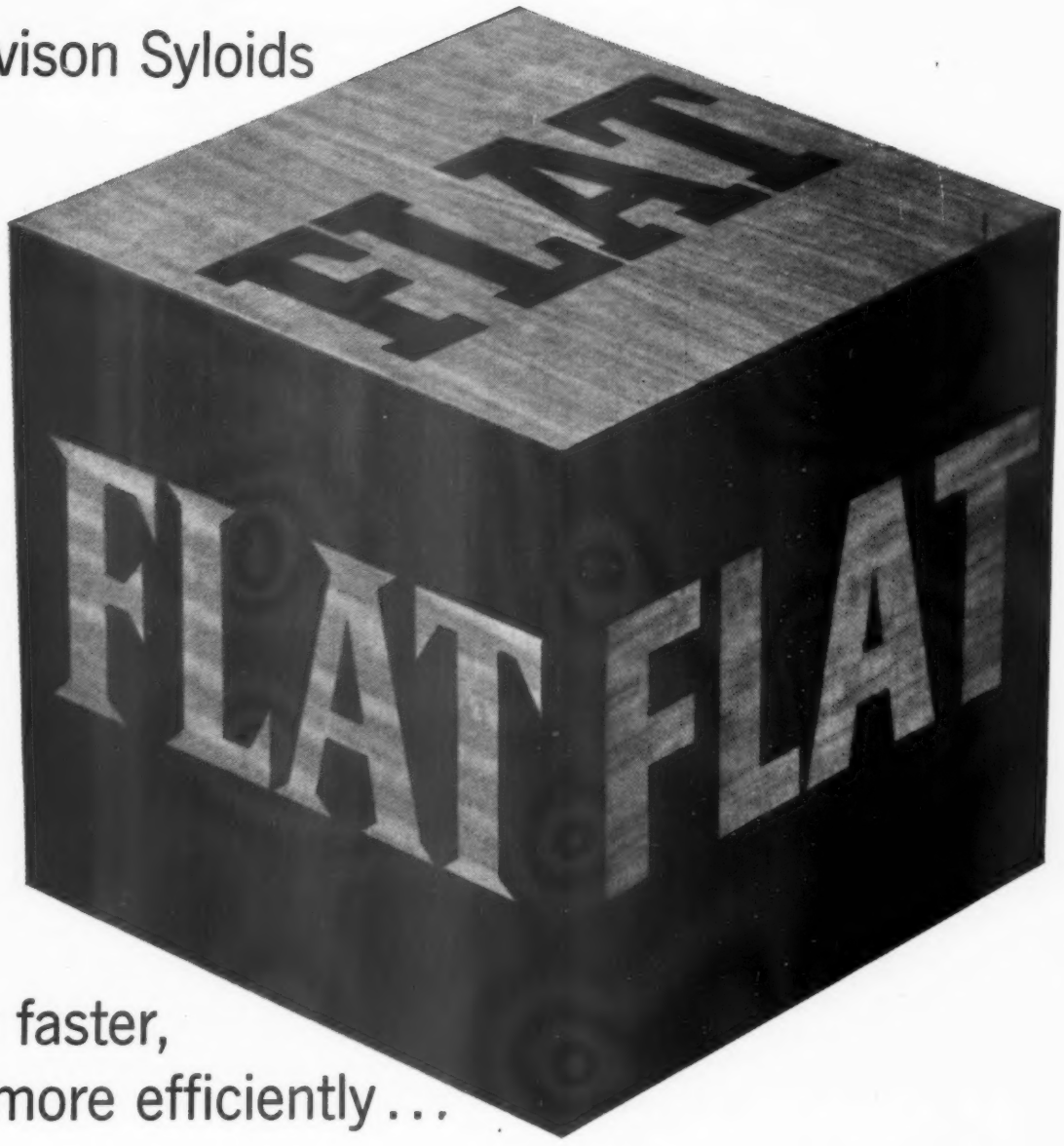

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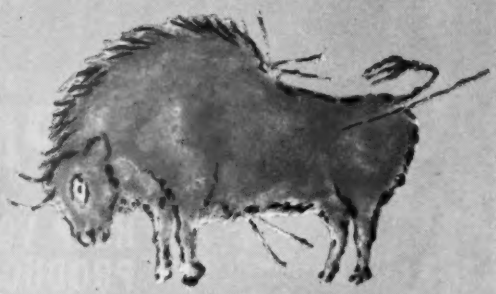

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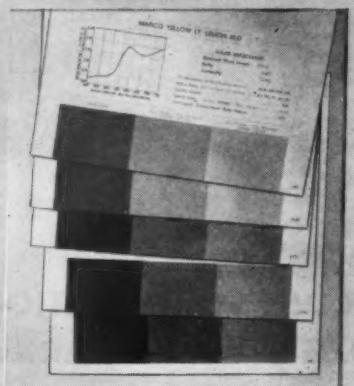

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WEATHER RESISTANT POLYVINYL ALCOHOL COATINGS

Solvent-resistant polyvinyl alcohol coatings with good weathering properties were developed. Using water as the principal solvent, the coatings are formulated to form acetals that resist solution. The effect of various ingredients on the coating properties are presented.

By
Karl F. Plitt*

POLYVINYL alcohol possesses a combination of physical and chemical properties that make it well suited for a number of applications. Film, fibers, and coatings of this polymer have high tensile strength, flexibility, and abrasion resistance. Coatings and adhesives based on polyvinyl alcohol have excellent adhesion to organic materials such as wood, paper, leather, and textiles. Polyvinyl alcohol film and coatings have high resistance to penetration by organic solvents and vapors. A detailed summary of the properties and uses of polyvinyl alcohol as well as a bibliography of the literature on this polymer is presented by Platzer (1)[1].

Because of its high organic-solvent resistance and excellent physical properties, polyvinyl alcohol was selected as a base material in developing coatings for use where toxic organic liquids (e.g., liquid mustard gas) are handled. A coating was needed that would completely resist penetration by toxic liquids of vapors and would not be affected by the solvent action of these chemicals. It was also necessary that the coating withstand the effects of weather and occasional washing with cleaning chemicals such as detergents, alkali, and hypochlorite solutions. Tests of a number of proprietary paint coatings had shown that only baking-type phenolic coatings had the necessary resistance to penetration by organic vapors. Because baking is impractical in some situations, other means of providing the required resistance to penetration were considered. It appeared that polyvinyl alcohol would be useful for applications of this type if its resistance to water could be increased without adversely changing its desirable properties.

A large number of experimental formulations were prepared and tested in an effort to develop polyvinyl alcohol coatings having the required water resistance. Ultimately, dimethylol urea was found satisfactory as an insolubilizer. This compound gradually decomposes with the production of formaldehyde. In the presence of a small amount of acid, the formaldehyde reacts with the polyvinyl alcohol to form insoluble acetals (2).

The polyvinyl alcohol coatings may be applied by conventional painting techniques. However, a primer should first be applied to nail heads or other metal surfaces as weathering causes these coatings to corrode iron or steel.

Materials

Several types of polyvinyl alcohol resins were investigated for use as the base material for polyvinyl alcohol coatings. Only the grades described at 99% hydrolyzed (2)[2] were found to have the necessary organic-solvent resistance. A medium-viscosity, 99%-hydrolyzed grade was finally chosen because it also has acceptable strength properties. The choice of this high-hydroxyl polymer made the problem of producing a weather-resistant coating more difficult because polymers of this type are water soluble. Formulations

*Plastic Section, National Bureau of Standards, Washington, D. C.
The results described in this paper were obtained in a project financed by the Corps of Engineers, U. S. Department of the Army. Their support is gratefully acknowledged.

1. Figures in brackets indicate the literature references at end of this paper.

2. Polyvinyl alcohol is prepared by the hydrolysis of polyvinyl acetate.

Components	Formulations by Coating Number[a d]										
	1[b]	2[c]	3[b]	4[b]	5[b]	6[c]	7[c]	8[c]	9[c]	10[c]	11[c]
polyvinyl alcohol medium viscosity, 99% hydrolyzed[e]	100	62	66	56	77	52	58	52	54	41	47
ethylene glycol			26			21	12		21	16	20
glycerol		31									
dimethylol urea			7	6		5	6	5			2
Sodium dichromate					4				4	2	
ammonium chloride			1	1		1	1	1			1
aluminum powder						21		26	21		26
Polyglycol P-750[f]				23							
Carbowax 4000[g]							23				
Acrawax C[g]				14				16			
Rezowax B[g]					19						
stearic acid		6									
sodium carboxymethyl cellulose											1
sodium lauryl sulfonate											1
isoamyl alcohol											2
sodium hydroxide		1									
titanium dioxide										41	

[a] Parts by weight
[b] Only non-solvent constituents are listed. The solvent for these coatings is water.
[c] The solvent for these coatings is water 4 parts, isopropanol 1 part.
[d] The finished coatings contained 15 to 20% non-solvent constituents.
[e] Elvanol, Grade 71-24, E. I. DuPont de Nemours and Co., Inc.
[f] The Dow Chemical Company
[g] Glyco Products Company, Inc.

Table I. Formulations of experimental coatings.

of typical experimental coatings based on this resin are given in Table I.

The principal plasticizers used were ethylene glycol, glycerol, and phosphoric acid. Some experimental coating formulations were produced that contained water-soluble waxes, polyethylene glycols, and polypropylene glycols as secondary plasticizers.

Insolubilizing compounds used in the coatings include formaldehyde producing compounds as well as other compounds, e.g., chloral hydrate, 2-ethyl butyral, 2-ethyl hexanal, n-hexanal, phenyl hydrazine, 2,4-dinitrophenyl hydrazine, and cupric dichromate. Emulsions of synthetic waxes were added to some experimental formulations in an effort to increase water resistance.

Preparation

In preparing coating formulations, the polyvinyl alcohol was first added to the water at room temperature. This mixture was then heated to about 80° C to dissolve all of the polyvinyl alcohol. For those formulations containing dimethyolol urea, this material was ground and dispersed in water (100 parts water to 1 part dimethylol urea), then stirred into the hot solution. After the solution had cooled, the other ingredients were added.

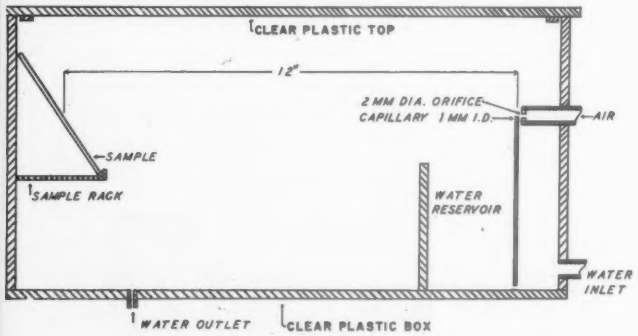


Figure 1. Water spray apparatus.

Tests

All coatings were tested for resistance to penetration by toxic organic liquids. To determine resistance to water and weather, they were also subject to (1) a water spray test, (2) a sunlamp-fog laboratory aging test, and (3) outdoor weathering.

Water-spray test

The apparatus used in the water-spray test (Figure 1) consisted of a closed box of clear plastic fitted with a specimen rack at one end and a series of atomizers, one for each specimen, at the other end. The center of each specimen was 12 ± 0.6 in. from the corresponding atomizer nozzle.

The atomizers were constructed of glass capillary tubing (1 to 1½ mm inside diameter) clamped in front of a fine air nozzle. One end of the capillary dipped into a reservoir through which a fresh supply of cold water flowed. The air pressure was adjusted so that a light mist of water impinged on the surface of each specimen.

The specimens were prepared by applying three light spray coats on each of three successive days to 4 x 6 inch glass panels. The specimens were allowed to age at 23° ± 1° C and 50 ± 4 percent relative humidity for seven days and then placed in the spray apparatus for 48 hours. A coating was considered successful if it resisted the spray for 48 hours without dissolving, eroding, blistering, or wrinkling.

Sunlamp-fog laboratory aging test

The sunlamp-fog laboratory aging test was conducted in accordance with Federal Specification L-P-

Coating Number	Water Resistance	Laboratory Aging	Outdoor Weathering
1.	Softened 30 min., did not wash off after 48 hr.	No data	2 da badly checked; 3 da heavy wrinkles; 3 wk peeled around edges of plates; 5 wk lifted away from plate in many places, slits appeared at a number of sites
2.	48 hr. swollen, intact	900 hr wrinkled but otherwise unchanged	6 mo numerous pinholes
3.	30 hr dissolved	900 hr wrinkled, tends to peel away from plate at the edges	9 mo numerous wrinkles
4.	48 hr slight softening	8 hr alligatored; 900 hr no additional change	2 wk, badly wrinkles; 5 mo many pinholes
5.	48 hr no change	900 hr surface covered with very small cracks visible under magnification	5 mo numerous small holes
6.	48 hr no change	900 hr no change	5½ yr surface eroded but coating otherwise intact and in good condition
7.	48 hr tends to shrink	900 hr some splitting due to coating shrinkage	10 da badly wrinkled; 2 wk split, peeled away from plate
8.	48 hr no change	900 hr no change	2 yr good condition; 2½ yr eroded through in places
9.	48 hr no change	No data	22 mo good condition; 2 yr pinholes developing
10.	48 hr no change	No data	4 mo, slight splitting along edges specimens; 2 yr no additional change; 2½ yr, coating eroded through in places
11.	48 hr no change	900 hr no change	2 yr, no visible change; 2½ yr numerous pinholes

Table II. Effects of laboratory aging, water resistance, and outdoor weathering tests on polyvinyl alcohol coatings.

406, Method 6021 (3). This test consists in alternately exposing specimens to ultraviolet radiant energy and to fog. The specimens were prepared and conditioned as in the water-spray test. They were then exposed continuously for 240 hours or longer by repetition of the following 24-hour schedule: 2 hours fog, 2 hours irradiation, 2 hours fog, 18 hours irradiation. Coatings were considered successful if they withstood this test for 240 hours without any visible effect such as cracking, blistering, wrinkling, checking, scaling, or flaking.

Natural weathering

Coatings that performed well in the water-spray and sunlamp-fog test were exposed to natural weathering. The coatings were sprayed on 8 x 10 inch glass plates, in several coats, to a total thickness of 3 to 5 mils. To insure complete drying, the specimens were kept indoors for 48 hours following application of the last coat and then placed in racks on the roof of a building at the National Bureau of Standards, Washington, D. C. The racks were inclined at an angle of 45° and faced directly south. Observations were made daily during the first two weeks that the coatings were outdoors, at weekly intervals during the remainder of the first year, and at six-month intervals thereafter.

Results

Of the more than 200 experimental coatings prepared during the development program, 11 have been selected to show typical results. Their formulations are presented in Table I. The results of water spray, laboratory aging, and weathering tests of these coatings are reported in Table II.

Coatings 1 through 5 of Table II are unpigmented; coatings 6 through 11 are typical pigmented coatings. Coating 6 is the first of the series that has satisfactory surface properties, toxic-solvent resistance, and weathering properties. It can be applied by brush or spray, and presents a pleasing appearance on drying. Coating 11 contains optimum amounts of the various ingredients to produce the desired properties.

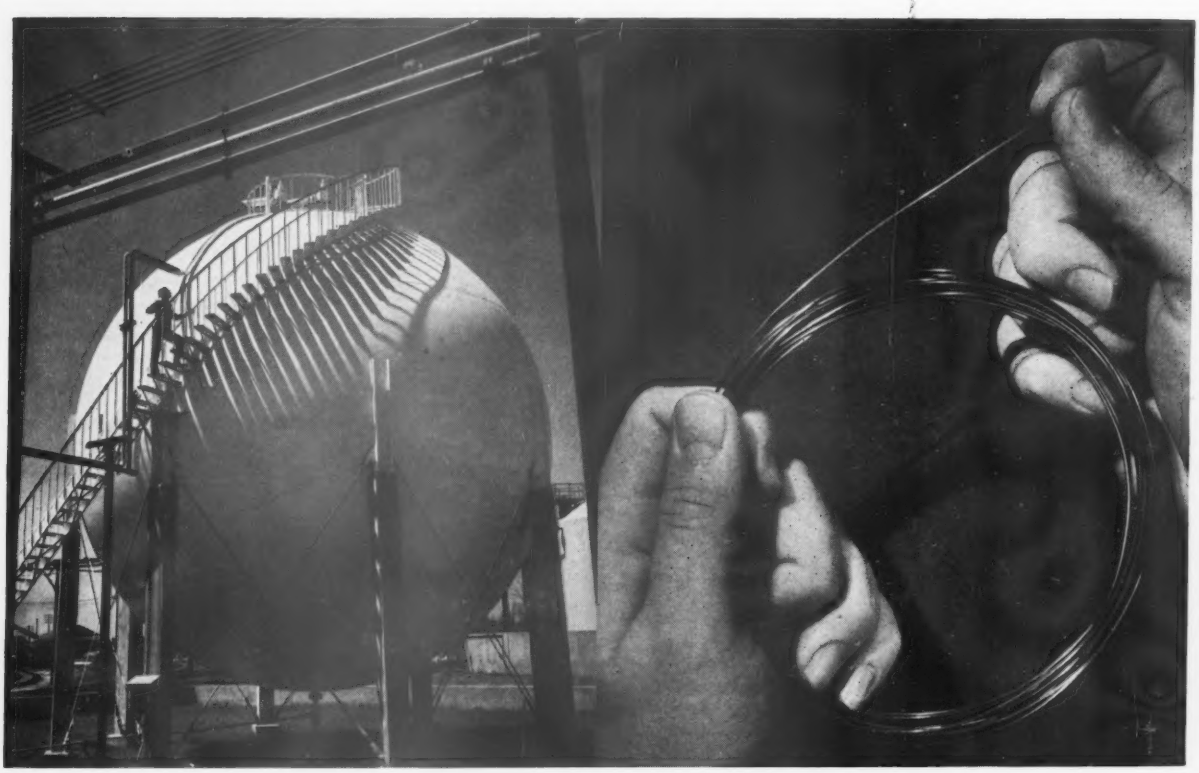
The unpigmented polyvinyl alcohol coatings generally did not weather well. After a few months of outdoor weathering they failed, usually because of the development of numerous pinholes. Most of them softened and swelled considerably under the water-spray test. However, the use of sodium hydroxide, dimethylol urea, sodium dichromate, and other compounds as insolubilizers decreased the water sensitivity.

The unpigmented coatings also wrinkled during application. The use of insolubilizers did not reduce the tendency to wrinkle, nor did the addition of glycol plasticizers or waxes. It was possible to eliminate the wrinkling by applying the coating in two layers. The first layer contained polyvinyl alcohol, a plasticizer, and the insolubilizer. The second layer contained polyvinyl alcohol, a plasticizer, and either an acid or acid salt to promote the insolubilization. A number of alternate layers were applied in this way to build up the desired coating thickness. However, a more successful way to overcome wrinkling was by the addition of pigment. Aluminum pigment, in the form of very small flakes, was especially effective.

Coating 6 tended to shrink when weathered for long periods of time, particularly through a number of wet and dry cycles. Investigation showed that an excess of

(*Turn to page 104*)

DU PONT HYLENE® adaptable to



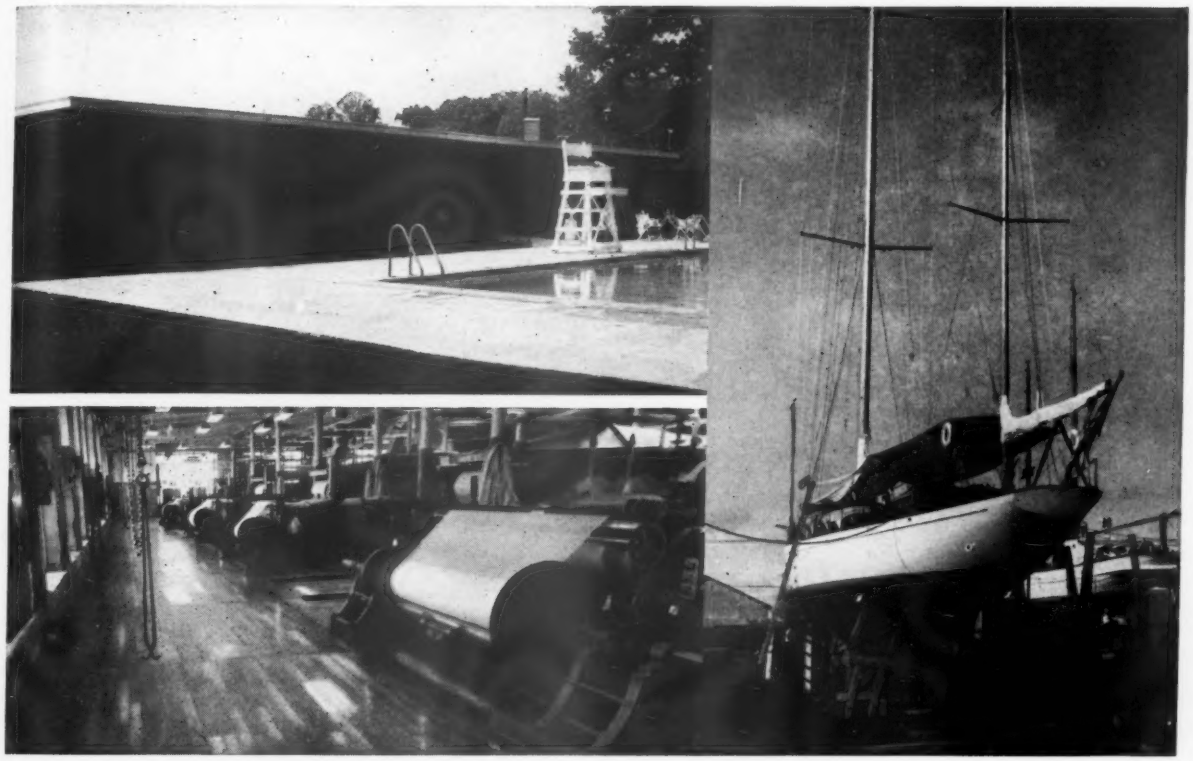
1. **Two-component system.** HYLENE isocyanate-polyol reaction product and polyhydroxy resin are *mixed prior to application.* These urethane finishes can be either clear or pigmented. They cure rapidly at room temperature and offer good film build. Potential uses include maintenance coatings with excellent weatherability and overall resistance to a wide range of deteriorating factors.

2. **One-component system requiring a heat cure.** In this system HYLENE isocyanate groups have been made nonreactive until application of 300° F. heat. These urethane coatings are finding industrial applications as wire enameling. Wire insulated with this kind of urethane finish can be soldered without stripping away the enamel.

3. **One-component system** containing a HYLENE isocyanate-terminated polymer *cured by atmospheric moisture* and not dependent upon oxygen. Such urethane finishes can be applied by all conventional methods. They have high gloss retention and weatherability. Suggested uses include clear interior or exterior finishes on wood, metal, leather and concrete. This type of urethane finish, in many uses, is superior to top-grade spar varnish.

4. **One-component system** created by reacting HYLENE isocyanate with a *drying oil.* High gloss, resistance to abrasion, moisture, solvents, chemicals, dirt and aging are characteristic of these urethane finishes. They can be compounded at a relatively low cost.

4 urethane coating systems



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ISOPHTHALIC ALKYDS in COATINGS

By
R. Burkel*

BY the way of introduction, we would like to define two of the terms used in the title, Isophthalic and Alkyds.

Isophthalic acid is a dibasic acid, the meta isomer of phthalic acid, better known in the trade as phthalic anhydride. The third isomer or para isomer is the terephthalic acid. The latter finds only limited applications in the protective coating industry, such as intermediate in saturated polyester formulations for wire coating. The symmetrical structure of terephthalic acid lends itself to the crystalline structure which is interesting for fiber forming polyester, but not for the type of polyester used in coatings.

Even though isophthalic acid is chemically similar to phthalic anhydride, its physical properties as well as its reaction characteristics are very different. For instance, the melting point of phthalic anhydride is about 131°C, the melting point for isophthalic is about 354°C. This accounts for the difference in sublimation rates among others. Orthophthalic is soluble in many of the solvents used as azeotrope in alkyd cooking, isophthalic is not; this brings about differences in processing techniques.

Historically, after a period of product development, Oronite Chemical Company was the first to introduce commercially isophthalic acid on the market in 1956. The manufacture of isophthalic was made possible by the recent progress in petrochemical processing which resulted in the development of successful techniques for the oxidation of the xylenes. The three isomers are currently produced from petroleum cuts. Two of them, phthalic anhydride and isophthalic, are widely used in the protective coating industry.

Several definitions have been given for alkyds. To narrow the field, here are two of the most commonly used. Alkyds are macromolecules resulting from the condensation polymerization of polyacids and polyalcohols, modified with oil or fatty acids, and alkyds are polyester chains modified with fatty acids. This description sounds simple enough. Unfortunately, alkyds turn out to be one of the most complicated and least known type of polyesters. The theory of functionality, developed by Kienle, Carothers, and Flory was a major contribution to the understanding of polyester chemistry. When applied to alkyd chemistry, this theory serves only as a rough guide. Alkyd chemistry is not yet an exact science. The old method of trial and error still prevails.

An alkyd is obtained by reacting a dibasic acid (functionality of 2) with a polyol such as glycerine (functionality of 3) and an oil (functionality depending on the degree of unsaturation of the fatty acids). The overall functionality of the system is more than two. Rather than form a linear polymer, the esterification reaction tends to produce a gel structure at high acid number, i.e., gel the resin in the kettle. The resin chemist will try by various methods to keep the alkyd from crosslinking before a given degree of polymerization is reached. For instance, the use of excess polyol to shift the equilibrium towards linearity or the use of alcohol of lower functionality such as glycol are well known practices.

Formulating with IPA

Over the years, several methods have been devised for calculating the formulation of an alkyd resin. The aim of such methods is to enable the resin chemist to formulate an alkyd for a given application and

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at the same time assure him that the resin will not gel during the processing operation. Most of these methods are evolved from both scientific and empirical ideas.

The scientific basis is the principle of linearity. Until the resin is laid out as a film, the alkyd should remain as linear as possible. Crosslinking should take place as little as possible in the process kettle; it should occur at the application stage when the film cures by air oxidation or by crosslinking with a nitrogen resin. To obtain linear molecules, the formulating practices contain various equations with either equivalent hydroxyl groups and equivalent acid groups or moles of acids versus moles of alcohols. To speed up the esterification reaction and to prevent early gelation, the system usually has an excess of hydroxyl groups over carboxyl groups.

As was pointed out before, the alkyd system is very complex. A number of side reactions occur in the kettle, depending on the raw material used, the temperature, and method of processing. In short, it does not lend itself to strict mathematical formulations. This is where the experimental or empirical angle comes into the picture. The equations are supported by statistical data of curves, established on a large number of cooks (laboratory or industrial batches). This is in order to overcome the limitations of the equations.

These calculations methods are very useful as a time saver. Without them, it takes anywhere from ten to fifteen cooks to establish a usable formulation; with them, the number of cooks required can be cut down to three or four (including the all important cook to the gelation point to determine a safety factor, to avoid gelation in plant equipment). One important point to keep in mind when making these preliminary runs is the fact that the curve of the acid number versus the reciprocal of viscosity is fairly linear and the intersection of this curve with the acid number axis give the acid number at the gel.

However, our intent is not to hold a detailed discussion of each method but rather to define, as much as possible, what makes a good alkyd and to see where and how isophthalic acid can help the resin chemist to solve his formulation problems.

Two of the main ideas to keep in mind, when one is formulating an alkyd, are linearity and homogeneity. Linearity is corollary to the principle of diffunctionality. To the man who cooks the resin, it means a great deal. As long as the alkyd molecule remains linear, he has a good control of the polymerization. Once crosslinking starts, there is no telling what happens. The molecular weight of the alkyd increases much too rapidly and the relative solubility of the alkyd decreases to an alarming level. The results are either a gel or a system with several phases (gel particles). In terms of properties, a linear alkyd has good solubility characteristics in low-cost aliphatic solvents. For air-dry resins, linearity means a better distribution of drying radicals (fatty acids), better pigment wetting characteristics and improved brushability. In baking resins, it gives a greater compatibility with nitrogen resins, because of the easier availability of free hydroxyl radicals for crosslinking.

The idea of homogeneity is closely related to the idea of linearity in so far that cross-linking is a localized phenomenon which detracts from both homogeneity and linearity. Solvency and extraction studies show that alkyds are a mixture of widely different types and quantities of molecular species. The curve of the molecular weight distribution of a given alkyd is far from an even bell shape. In general, the solubility sequence goes as follows: The high molecular fraction is soluble in the medium molecular fraction, this group is in turn soluble in the small molecular fraction and then in the solvent. If any of these fractions are removed from the alkyd, the solubility pattern breaks down, part of the alkyd goes out of solution.

It was found that the very high molecular fraction has very poor solubility, very low acid number, poor grinding characteristics. On the other hand, the very low molecular fraction has high acid number, very poor drying characteristics and no durability to speak of.

Both very high and very low molecular fractions are detrimental to an alkyd resin.

Comparing the three phthalic isomers will give us an idea of how best to achieve both linearity and homogeneity. Phthalic anhydride, due to the ortho position of its carboxyl groups does not seem to have the functionality potential of the other two isomers. For instance, both in alkyd and polyester formulations, a mole replacement of phthalic by isophthalic will bring about great increases in viscosity of the resins. Orthophthalic tends to form lower molecular weight species (by intraesterification or by deesterification because of the inherent weakness of the orthophthalic ester-bond). Moreover, to increase the viscosity of an orthophthalic alkyd, despite the formulation of these low molar species, the resin have a tendency to be overcooked, i.e. cross-linked to form some very large molecular species. Isophthalic will give better resins than orthophthalic because of its molecular configuration and its greater stability. But one fact should be kept in mind, isophthalic cannot replace phthalic anhydride on a mole basis, the alkyd formulation should be revised to take advantage of the greater functionality.

Terephthalic acid will give resins which are more linear than isophthalic. However, the symetrical structure of the para isomer imparts to the resin crystalline characteristics which are detrimental to a normal coating; for instance, high melting point, i.e. low solubility; high cohesive forces between molecule, i.e. fairly poor adhesive properties to various substrates. These and other reasons make terephthalic a poor choice as a dibasic acid for alkyd formulation.

For a practical standpoint, several factors should be known to insure proper formulation of isophthalic alkyds. For air-dry formulations in isophthalic modified oils and trade-sales resins, a maximum of 10 to 15% excess hydroxyl is sufficient to give good dry and, at the same time, to avoid excessive water-sensitivity, and loss of gloss. In the medium and short oil range, for industrial applications (both air-dry and short bakes) and for alkyd flat, formulations with pentaery-

thritol and glycerol, with excess hydroxyl ranging from 25% to 40% are excellent: high viscosity, speed of dry and good adhesion are obtained. If outstanding gloss retention is required, benzoic acid can be used as part of the oil modification of the alkyd. Since isophthalic gives higher viscosities than orthophthalic, benzoic modification can be made at longer oil length. If heat stability and chemical resistance are desired, a replacement of glycerine by trimethylolethane is recommended. For very short oils, 30% oil length and below, the use of glycol as a functionality reducer and promoter of linearity is not only recommended but necessary. Benzoic acid could be used but the finished film would be brittle. For baking type alkyds (cross-linked with amino resins), excess hydroxyl ranging from 4 to 8 parts per hundred are sufficient to insure adequare cure and tolerance to high ratios of nitrogen resins.

Summing up, the various systems of calculation of alkyds can easily be used with isophthalic, if one keeps in mind that isophthalic has a greater actual functionality than orthophthalic.

Processing with Isophthalic

Two basic characteristics of isophthalic are very important to the processing of isophthalic alkyds. First, isophthalic is an acid whereas orthophthalic is an anhydride; second, isophthalic has a much higher melting point than orthophthalic.

Isophthalic has much less tendency to sublime at conventional cooking temperatures than does phthalic anhydride. Fusion cooking techniques can be used with isophthalic with practically no loss by sublimation. On the other hand, because of the great differences in the rate of initial half-ester formation, fusion cooking with isophthalic can lead to appreciable polyol losses unless care is taken and an efficient condenser is used.

When phthalic anhydride is added to the alcoholysis products or to the fatty acids used for alkyd preparation, it will melt rapidly and form a clear solution. The anhydride ring opens and the formation of the half-ester is very rapid at temperatures around 300°F. This occurs without evolution of water. Isophthalic will not melt in the above mentioned ingredients, and the reaction mixture will only clarify as the isophthalic forms the half-ester. This reaction is usually slower than in the case of orthophthalic and does involve water formation.

Evolution of greater amounts of steam with isophthalic combined with an excessively high inert gas rate through the kettle will lead to steam distillation and removal of volatile polyols. Care should be taken during the heat up period after the addition of isophthalic. Once esterified, isophthalic does not deesterify, whereas orthophthalic is not very stable at high temperatures. Therefore, isophthalic alkyds can be processed at higher temperatures, excellent light colored alkyds can be obtained at cooking temperatures of 500°F to 525°F and even at oil bodying temperatures of 550°F and 575°F.

Isophthalic can be easily processed by the usual procedures: fusion in open and closed kettles and solvent cooking. A third and fairly recent processing method will also be discussed, acidolysis.

Since isophthalic is very heat stable, it is felt that various fusion processes are well suited. In open kettle, isophthalic is the ideal dibasic acid, because it does not sublime under normal conditions. This brings about lower cost, higher yields, good reproducibility and lower upkeep of equipment. This open kettle technique is applied to oils and long oil vehicles whenever color of the resin is not important.

For medium and short oil length isophthalic alkyds, since the amount of volatile polyols is greater, the closed kettle should be equipped with a fairly efficient condenser. The polyol entrained by the water of reaction will be separated (in the condenser) and returned to the batch. During the initial stages of the esterification, while relatively large amounts of steam are being removed, bumping can take place and air can be pulled back into the kettle, causing darker color. This can be avoided by placing a small liquid trap at the base of the exit line from the kettle so that no air can be pulled up into the exit line. The average inert gas flow should be of 0.003 cubic foot/minute/gallon until the clear cold pill stage is reached. Then increase the rate of 0.03 cubic foot/minute/gallon to help remove the last traces of water of reaction. Depending on the formulation, the clear cold pill stage will be reached when the acid number of the resin is about 20 to 30 on a solid basis.

The solvent cooking method is widely used to process orthophthalic alkyds. It provides an effective method for removal of water and it cuts the loss of orthophthalic to a minimum. Isophthalic acid is practically insoluble in the type of solvents commonly used for solvent cooking. As indicated earlier, isophthalic has a fairly slow rate of half-ester formation. If the azeotrope solvent is added to the batch with the isophthalic acid, there is a danger of mechanical entrainment of the free acid by the solvent into the condenser. Since the isophthalic is not soluble, it will deposit on the wall of the condenser. In order to prevent this and to avoid excessive carry-over of alcohol by the solvent, it is recommended to proceed by fusion until the batch clears. At that point, the solvent may be added and the reaction carried out in the same manner now used in cooking orthophthalic resins.

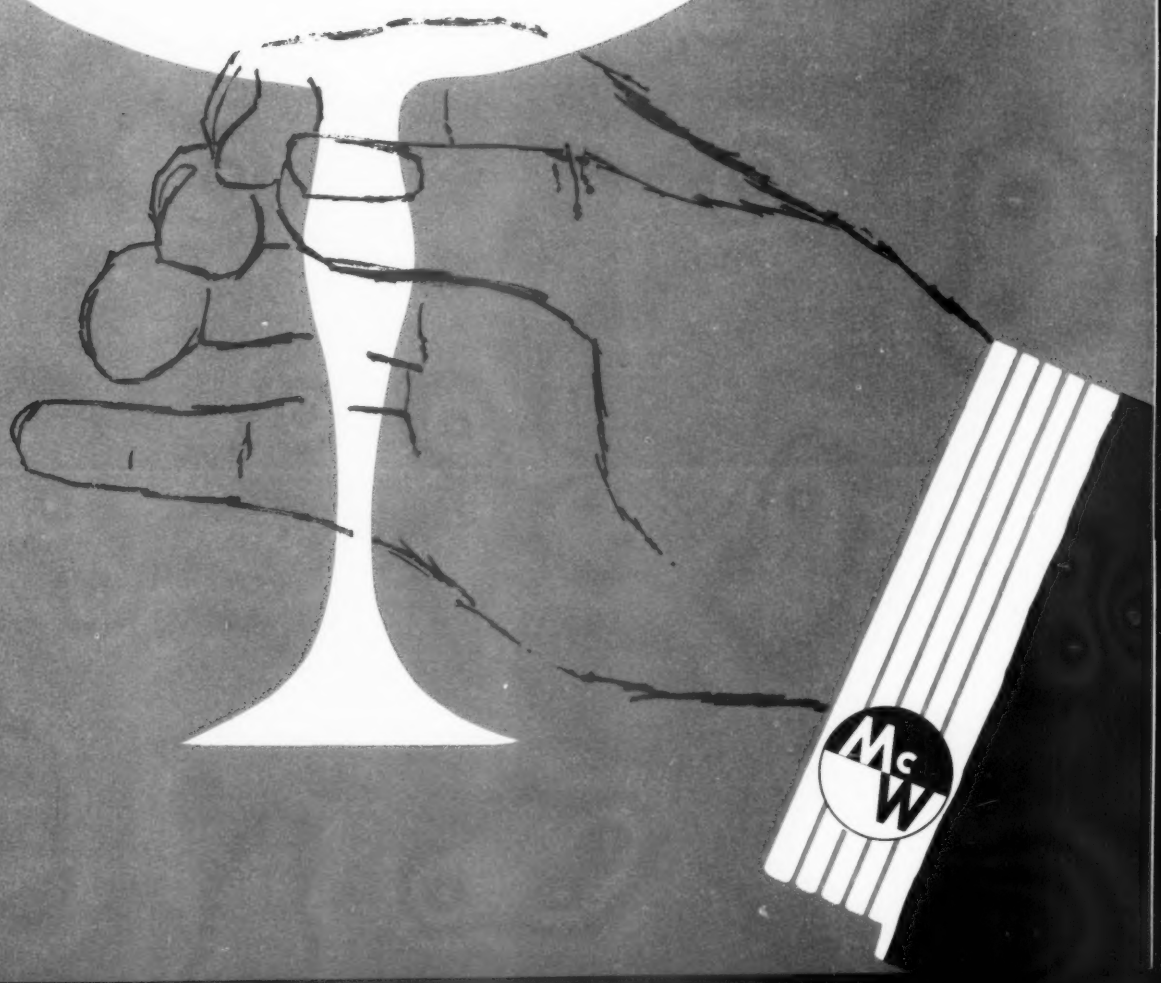
The third method is based on what is known as the acidolysis reaction. Instead of charging to the kettle, the oil and the polyol along with the catalyst to make an alcoholysis, the oil and the dibasic acid are charged, reacted and then the polyol is added. A considerable amount of work has been done to perfect the method. It is now being used on a commercial basis by several manufacturers for processing isophthalic alkyds.

The main advantages of the acidolysis methods over the others are shorter cooking cycle, lower polyol loss, and the production of a bright alkyd without filtration. The fact that terephthalic acid based alkyd can be processed fairly easily (i.e. in a reasonable length of time) gives an idea of the efficiency of the acidolysis method.

In a typical run, the oil and the isophthalic are charged to the kettle, the mixture is brought to a

(*Turn to page 111*)

HERE'S TO OUR 10TH ANNIVERSARY



Left to right:
Carl Lemcke, V. P. & Operations Manager;
Norman Baum, Factory Superintendent;
H. Douglas Spruance, Sales Manager;
Charles J. McWhorter, President;
Edgar Clark, Laboratory Director.

an equation of quality

122 + 10

= QUALITY

Quality holds a different meaning for each of us. It is financial integrity to the accountant . . . it is product uniformity to the plant superintendent . . . prompt service to the purchasing agent . . . first grade materials to the chemist.

McWhorter *quality* refers to our *ability* to develop, produce and deliver to you specialized resins for *practical* paint.

The quality of any organization's ability is heavily dependent upon its people . . . and their ability rests mainly upon the extent of their training and experience. The five men grouped at the left represent 122 years of background in paint vehicle development, manufacture and sales-service. Their broad experience forms the nucleus of the McWhorter organization, and has spearheaded our 10 years of rapid growth.

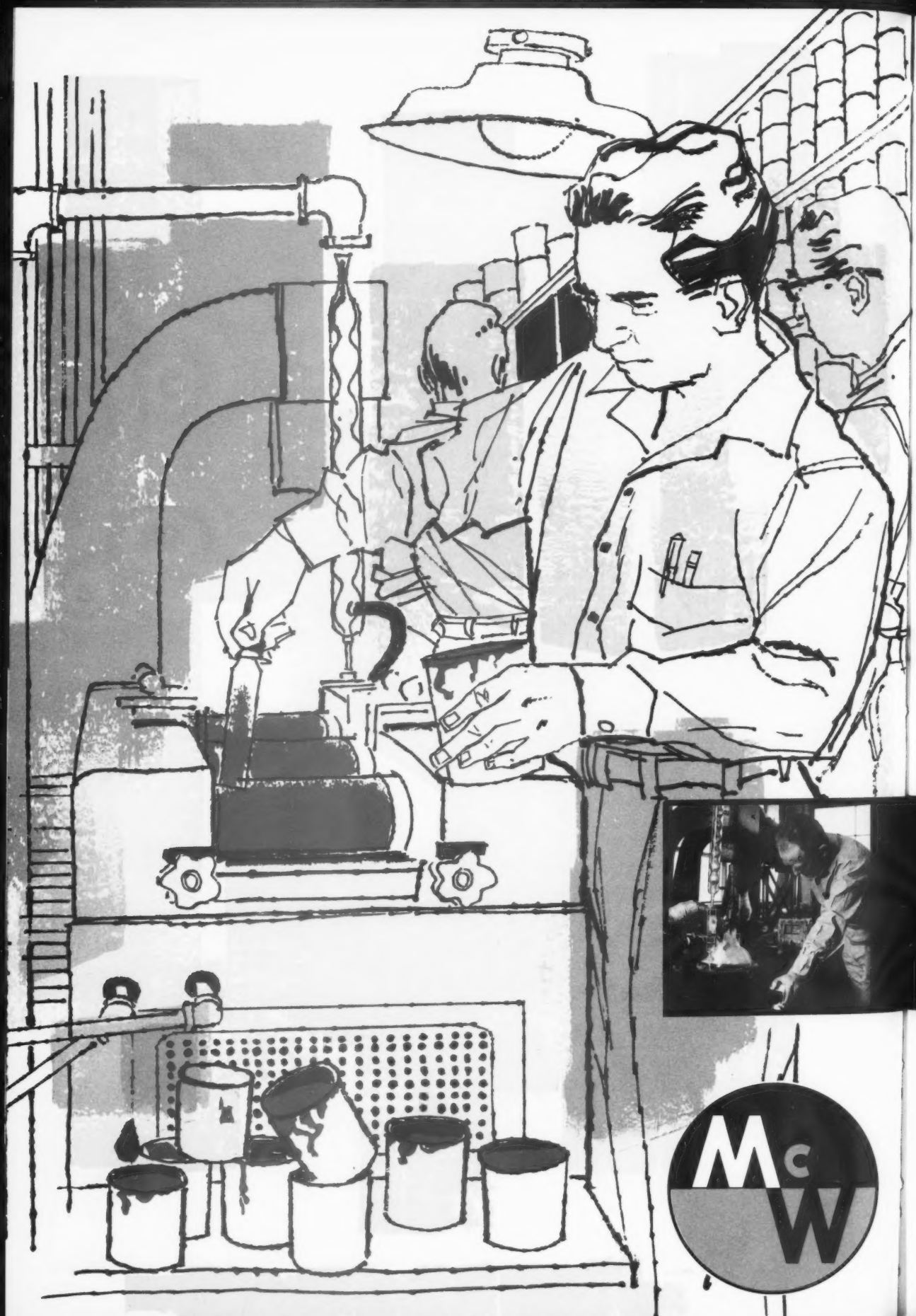
Paradoxically, it has been only within this past decade that alkyds have been refined and developed with the ultimate paint consumer in mind . . . advanced to the point where alkyd based paints represent today's major class of finishes.

This booklet is designed to acquaint you with the men, methods and materials which have made pioneering contributions to the relatively young field of alkyd architectural paint development.

Ingenuity is our key raw material

McWHORTER CHEMICALS, INC.

1645 South Kilbourn Avenue, Chicago 23, Illinois


Mc
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in research

Ingenuity solves today's alkyd problems . . .
Today's research anticipates tomorrow's needs

In 1949, when our doors first opened, alkyds were not new. Oil modified alkyds had been known for 35 years. Fundamental research chemists had long been reacting chemicals to make *theoretically* fine alkyds. Unfortunately many gave too little thought to the practical problems of the paint-buying public.

For ten years McWhorter Chemicals' laboratory effort has meant teamwork with our customers. While we have worked on solving their problems, they have directed our attention towards the ultimate goal, the final paint product.

Here at MCI we applied deductive theory to develop ingenious *new* techniques to create alkyds for more useful and practical paints . . . alkyds that help our customers stay ahead of consumer demands, as well as captive producers.

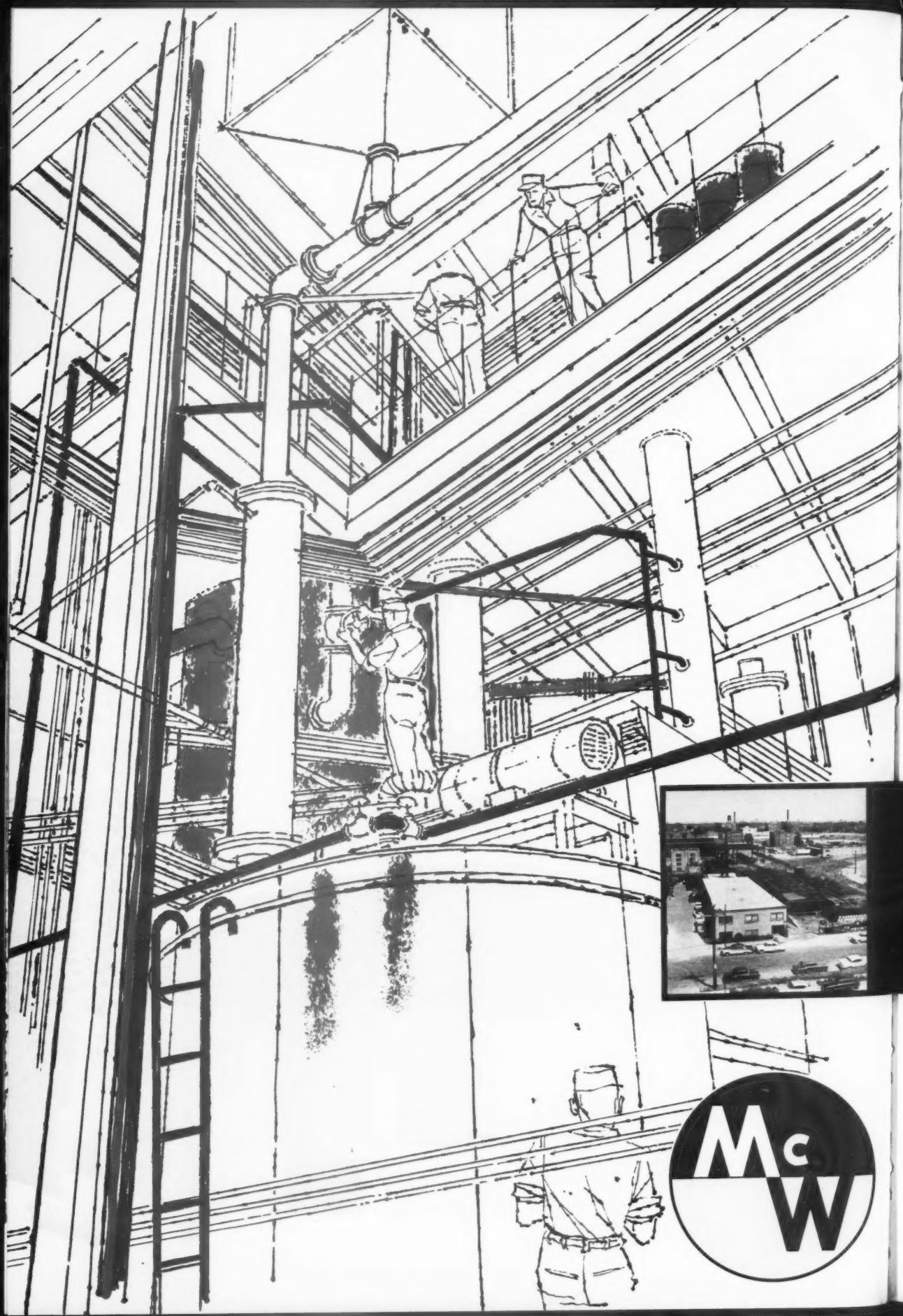
We have worked constantly with our raw material suppliers to help them improve their chemicals to give you better alkyds; to better refine by-products to give you more economical vehicles; to evaluate new chemicals to fit them into the jigsaw puzzle of our tremendous accumulation of background know-how.

Our objective is twofold: (1) to keep pace with your current requirements; (2) to anticipate your future needs, so that we will be poised to offer you every advantage when the call comes for ACTION.

Ingenuity is our key raw material

10th anniversary

McWHORTER CHEMICALS, INC.


Mc
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in production

Custom Engineered equipment and skilled supervision mean uniform products

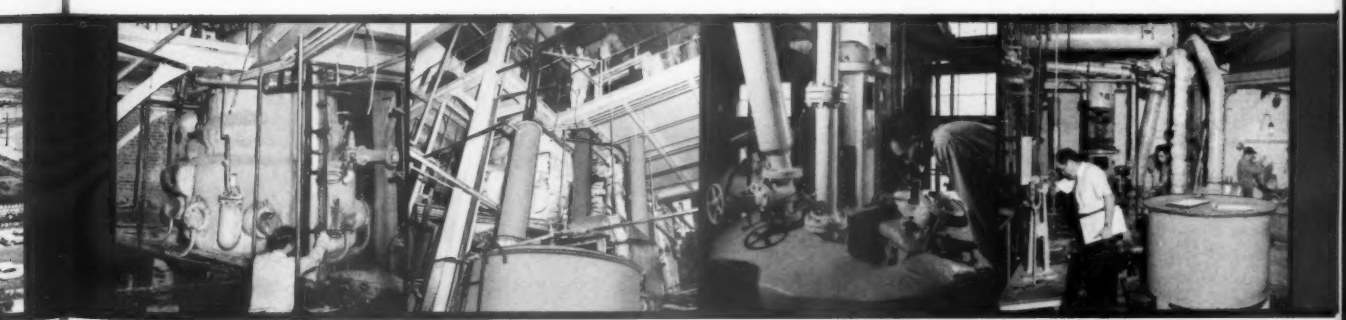
Developing an exacting alkyd formula is one thing . . . the ability to produce it in large amounts, at practical cost and in proper uniform quality, is another.

Our recent expansion program assures the physical capacity so vital to produce in practical volume. Special engineered equipment offers you every quality and cost control advantage. Example: The indirect vapor-heated type of reactors now used by McWhorter are by far the most expensive type available, but, it has been well established that such equipment produces the highest quality alkyds possible from a given formulation.

Supervisory and operating personnel are well educated, specially trained and thoroughly experienced in resin production. Utilizing unique proven methods, they control each batch during reaction to make certain each is right. We do not believe in blending or using additives to bring improperly made alkyds into physical specification, only to produce erratic results in your plant.

Abundant bulk storage and warehousing facilities also enable you to enjoy the full cost advantages of our savings in purchasing raw materials in the most economical volume units . . . as well as adequate in-stock availability of many products.

Controlled alkyds save headaches in your plant



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REZIMAC
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in service

Your reliable source for technical assistance and dependable delivery throughout the midwest

McWhorter service means prompt delivery, of course. But, it is not narrowed to that common interpretation. Our entire supply line, from research through manufacturing to your receiving platform, is planned and coordinated to bring you *maximum* benefits.

The ingenious development of the alkyd that solves your formulating problem . . . the modern volume production equipment that holds down costs . . . the dependable, controlled product uniformity that smooths your plant operation . . . the large storage facilities that assure prompt shipment . . . specially designed tank truck equipment that handles realistic unit quantities in bulk delivery—all are the results of our *experience* and *interest* in helping you. These are the factors that help you solve inventory problems and produce the paint value necessary to keep a competitive edge in today's market.

The more we help our customers, the more we will grow.

10th anniversary

McWHORTER CHEMICALS, INC.

McWHORTER
McW

beyond the horizon

Alkyds are at present the only resins which combine the proper balance of package stability, working quality, film durability and economical utilization. Their potential as building blocks for modification with less stable and too costly, but more durable, linkages such as iso-cyanate is tremendous. Incorporation of new functional chemicals, such as iso-phthalic acid, to gain greater usefulness has only been scratched.

Although a replacement for alkyds is not in the immediate future, it may be an embryo in our laboratories. The McWhorter research staff is experimenting with alkyds, urethanes, polyesters, polyamids, polyethers and copolymers—using new reactants as they are uncovered.

These new ideas plus those over the horizon—fortified with knowledge gained from past experience—are destined to make paint improvement even more fascinating and rewarding in the next decade.

Next time you are faced with a paint vehicle problem, give us a call. We will welcome the opportunity of working with you.

Ingenuity is our key raw material

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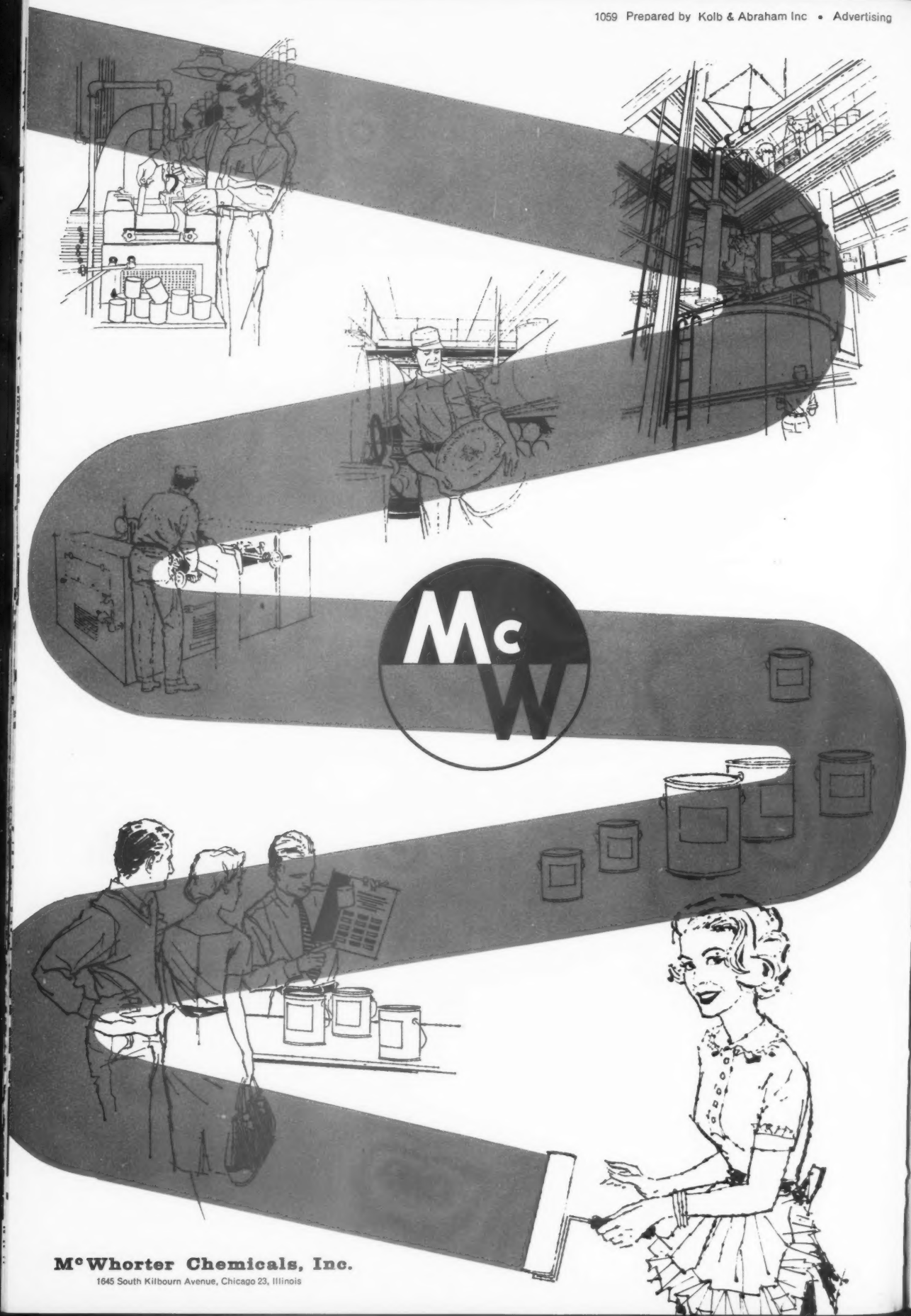

Mc Whorter Chemicals, Inc.

1645 South Kilbourn Avenue, Chicago 23, Illinois

DETERMINATION OF THE MODULUS OF ELASTICITY IN THE STUDY OF PAINT FILMS

By
H. Van Hoorn
and
P. Bruin

IN the paint and varnish industry use is made of many types of physical testing methods. The nature of these varies considerably. The majority are directly related to practical applications, i.e. they check a property of the supported film which is important for a specific application. For a full "paint-technological" description of the film a large quantity of these tests are required. However, these test methods frequently give insufficient scientific information about questions such as correlation between properties and structure of the film or the behaviour of films under special conditions. Up to now only a few methods are suitable for such investigations and the development of new basic methods is highly desirable. One can understand this situation very well if one considers the history of the paint and varnish industry. A large part of the development of this industry took place in a time when chemistry and physics had not progressed far enough to render a fundamental approach possible. Even today it is questionable whether we have enough background to tackle successfully the fundamental problems of surface coating technology. This is demonstrated very well if one reviews the problem still encountered in the study of unsupported films of high molecular weight compounds. With supported films the nature of the substrate and the adhesion of the film to the substrate are additional factors complicating the investigation.

In the last few years many investigators have endeavoured to put the study of paint and lacquer films on a firmer scientific basis. An excellent survey of these attempts has been given by Bradley[1]. The work done by Talen[2] clearly demonstrates the problems involved.

The authors are associated with Koninklijke/Shell-Laboratorium, Amsterdam, Holland.

This paper was presented at the 133rd meeting of the American Chemical Society, Div. of Paint, Plastics, and Printing Ink Chemistry in San Francisco.

The requirements for a method for scientific study of paint layers are:

a. it must be applicable to the total system, i.e. to the film on the substrate; and

b. application of the method should not lead to damage or permanent deformations which change the system.

These requirements are fully met by methods based on vibrations. In the following our first experiences with one of these methods will be reviewed.

We started from a method developed a few years ago in our laboratory for the study of supported asphalt layers[3]. According to this method the resonance frequencies for bending vibrations of metallic bars both as such and after being covered with a thin layer of asphalt are determined. From the difference in resonance frequency the dynamic modulus of elasticity can be calculated.

With slight modifications, this method has proved to be suitable also for paint and varnish films. In order to obtain a good idea of the value of the method as regards sensitivity to small variations in film constitution we investigated several systems encountered in practice.

Theory

Vibration formulae

For a bar of rectangular cross section clamped at one end the resonance frequencies are given by the formula[3]:

$$f = \frac{\alpha_i^2 h_1}{2\pi L^2} \sqrt{\frac{E_1}{12\rho_1}} \qquad (1)$$

In this formula h_1 = thickness of the bar
L = length of the bar

ρ_1 = density of the material
E_1 = modulus of elasticity of the material
α_1 = a root of the equation $\cos\epsilon \cosh\epsilon = -1$, which can be derived from the differential equation and boundary conditions describing the vibrational system[3]. As we will only consider the lowest or fundamental frequency of the system, $\alpha_1^2 = 3.51$.

For a bar covered on both sides with a layer of thickness h_2 of a material having a density ρ_2 and modulus E_2 the resonance frequency is:

$$f' = \frac{\alpha_1^2}{2\pi L^2}\sqrt{\frac{\frac{1}{12}E_1h_1^3 + E_2\left(h_1h_2^2 + \frac{1}{2}h_1^2h_2 + \frac{2}{3}h_2^3\right)}{h_1\rho_1 + 2h_2\rho_2}} \qquad (2)$$

If we introduce $x = \frac{h_2}{h_1}$ and rearrange the formula, we find

$$f' = f\sqrt{\frac{1 + 2\frac{E_2}{E_1}(3x + 6x^2 + 4x^3)}{1 + 2\frac{\rho_2}{\rho_1}x}} \qquad (3)$$

For thin covering layers ($x << 1$) formula (3) can be replaced by the approximation formulas:

$$f' = f\left[1 - \frac{\rho_2}{\rho_1}x + \frac{E_2}{E_1}(3x + 6x^2 + 4x^3)\right] \qquad (4)$$

$$\frac{f' - f}{f} = -\frac{\rho_2}{\rho_1}x + \frac{E_2}{E_1}(3x + 6x^2 + 4x^3) \qquad (5)$$

Formula (4) clearly expresses the fact that the added mass tends to lower the resonance frequency whereas the added bending stiffness tends to increase it.

Principle of the Experiments

From the calculations described above it follows that by measuring the resonance frequencies of for instance, a thin steel strip before and after covering with a paint or varnish layer the modulus of elasticity of the material in the layer can be calculated if thickness and density of the layer are known. However, this requires extremely accurate frequency measurements because f'-f is as a rule very small. Therefore, it is more attractive to measure the difference or beat frequency f'-f itself directly in an experiment in which a covered and an uncovered strip vibrate simultaneously.

Unfortunately it is nearly impossible to produce two exactly equal strips. An indirect comparison can, however, be made by:

a. first measuring the beat frequency of two uncovered steel strips;
b. subsequently measuring the beat frequency of the same strips, one being now covered with a varnish or paint layer.

The difference of these beat frequencies equals the difference f'-f.

Experiments

Apparatus

Figure 1 gives the block diagram of apparatus used.

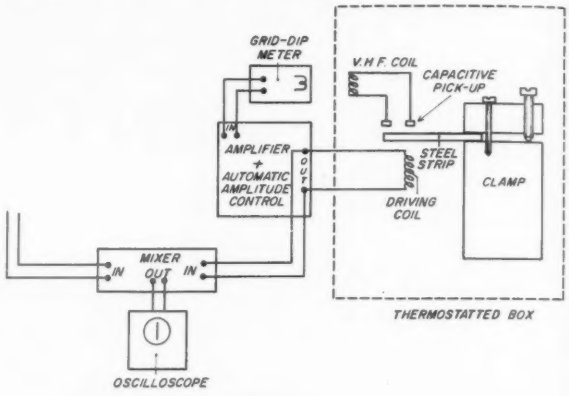

Figure 1.

The strips are firmly clamped in to ensure rigorous constancy of the strip dimensions. A movement of the strip produces a change in tuning of the very high frequency (VHF) circuit, consisting of the coil L and the small capacitor formed by the steel strip and the two small brass blocks opposite to it. As a result the grid-dipmeter coupled to this circuit gives a change in grid voltage, which is fed into an amplifier. This amplifier feeds the driving coil and so a force is exerted on the strip in tune with its own movement. It will then continue to vibrate as the amplifying system counteracts the damping. In practice some small mechanical or electrical disturbance is always present so that the vibration is self-starting.

An amplitude control is connected to the amplifier in order to keep the vibration amplitude automatically at a constant low level. (In the calculations mentioned above a linear relation between stress and strain was assumed and this holds true only for small amplitudes.)

To measure the beat frequency of two simultaneously vibrating strips, two of these systems are used, the amplifiers being coupled via a buffer stage to a mixer. This gives a quasisinusoidal signal having a frequency equal to the mean value of the input signals and an amplitude varying in the beat rhythm. With the aid of an oscilloscope and a stopwatch the frequency difference can now be determined.

Procedure

The determination can be subdivided in the following steps:

a. The equipment is checked with two vibrating steel strips for constant frequency and reproducibility (the frequency should not change if a clamp holding a strip is taken out and put back again).
b. One clamp is taken out and the strip is treated as necessary for the application of the film (see below).
c. The clamp with the cleaned strip is put into the holder again and the beat frequency of the two strips (F-f) is measured.
d. The clamp with the cleaned strip is taken out

and the strip is coated with a paint or varnish layer (see below).

e. The clamp is put into the holder again and the beat frequency (F-f) is measured again. In the case of through-hardening, measurements are carried out at regular intervals giving $F-f_1$, $F-f_2$, $F-f_3$, etc.

f. The absolute value of the frequency f is measured with a calibrated oscillator or a pulse counter. The factors can now be calculated

$$\frac{f_1-f}{f}, \frac{f_2-f}{f}, \frac{f_3-f}{f} \text{ etc.}$$

and are introduced into equation (5), yielding the modulus of elasticity if density and thickness of steel strip and paint layer are known.

Treatment of the steel strips

Strips of 7 by 1 cm are made from ordinary steel sheet 0.265 mm thick.

Before application of the paint or varnish layer the strips are cleaned with dichloroethane. When changes of the paint layer during baking must be observed they are also heated for some time at the baking temperature before coating until no further change of their proper frequency can be detected. This is necessary to avoid the influence of the baking on the modulus of the steel strip itself during the actual experiment.

The coatings are applied by dipping.

Examples of Applications

In order to learn something about the sensitivity of the method to the changes occurring in lacquer films in actual practice, it was used to measure the change in modulus of elasticity of three different films based on epoxide resin during curing or stoving.

a. the curing of "Epikote" 1001 at room temperature under influence of ethylenediamine;
b. the through-hardening of an ester of "Epikote" 1004 and linseed oil fatty acids (L-8);
c. the curing of a mixture of a urea-formaldehyde resin and an ester of "Epikote" 1004 and dehydrated castor oil fatty acids (D-4).

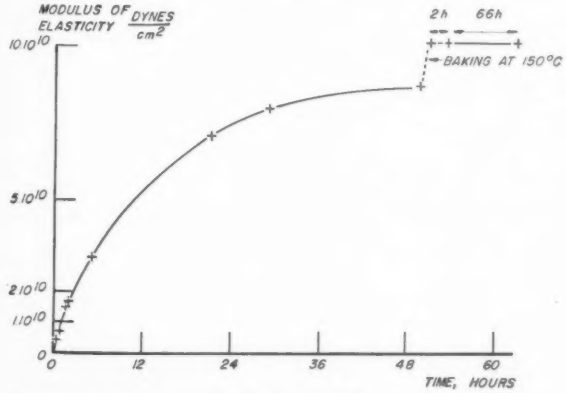

Figure 2. Hardening of "Epikote" 1001 under the influence of ethylene diamine (4.5 phr) at room temperature. Layer thickness of 50 microns.

The change of the modulus of elasticity in case *a* during the initial 48 hours of the through-hardening is demonstrated in Fig. 2.

From this figure it can be concluded that:

1. the increase of the modulus of elasticity decreases with the time. The increase is extremely rapid during the initial 24 hours of the through-hardening, but levels off during the second half of the treatment;
2. the rate of increase during the second day is so small that it can be doubted whether curing at room temperature will ever lead to the high modulus obtainable at high temperatures. (The modulus can be raised further from 8.7 x 10^{10} to 10.1 x 10^{10} by baking at 150°C during 1 hour, see right side of figure). This is in good agreement with the well-known differences between air dried and stoved films of "Epikote" 1001.

This experiment indicates that considerable knowledge on "Epikote" 1001 amine cured systems can be obtained by studying the course of the modulus of elasticity of the film at various temperatures.

Fig. 3 illustrates a similar experiment with an air-drying ester prepared from "Epikote" 1004 and linseed oil fatty acids (L-8 ester).

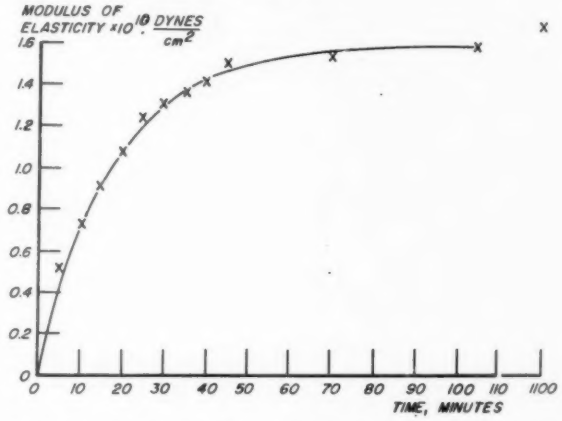

Figure 3. Hardening of an L8-ester in a layer thickness of 65 microns.

The increase of the modulus of elasticity is extremely rapid during the first 50 minutes. In the next stage of the through-hardening it still increases but much more slowly. Here too our observations agree with the known drying properties of "Epikote" esters; after a rapid initial through-drying their properties change but very slowly.

Curing at 150°C of the system D-4 ester/urea-formaldehyde resin (ratio 70:30) also results in a rapid increase of the modulus of elasticity during the first minutes of baking followed by a slow increase during the further through-hardening. (The modulus of elasticity which reaches 3.7 x 10^{10} dyne/cm² after 20 minutes increases only to 4.4 x 10^{10} dyne/cm² after 30 minutes.)

Again this is in accordance with the qualitative behaviour observed in practice: the system sets extremely fast.

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3) W. Heukelom and A. Schuringa. Unpublished. W. P. van Oort. Transactions of Instruments and Measurements Conference, Stockholm, 1952, p. 267. A.E.H. Love. A treatise on the mathematical theory of elasticity, 4th ed. Dover Publications, New York, 1944, p. 429 ff.

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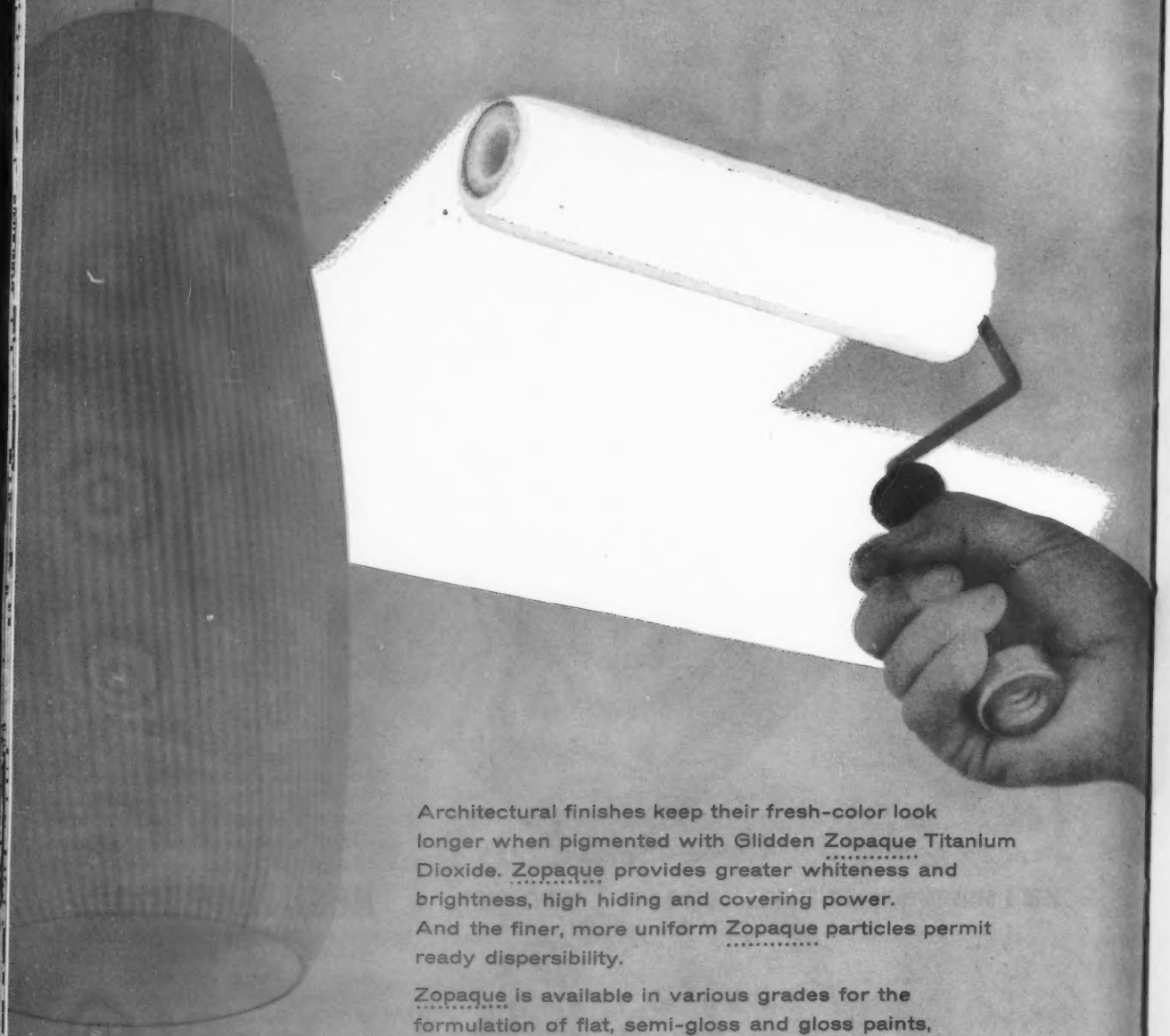

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By
Phil Heiberger

The author continues his random reflections on various aspects of the paint industry. The opinions expressed in this column are his alone and do not necessarily reflect those of this publication.

Perils of Pollutants

The following item, gleaned from a botanical journal, provides another of the rapidly accumulating bits of evidence that provide indisputably the numerous perils and complications of air pollutants. G. W. Todd and M. J. Garber (*Botan. Gaz., 120*, 75, 1958) found that plant growth is adversely affected by air pollutants and that bean plant growth specifically, is suppressed by exposures to ozonated hexene. A mere half hour exposure to ozonated hexene retarded for a day or two the height growth of the plants. No other visible symptoms of injury were observed. (It might be interesting to speculate about the effect of continuous exposure.) Of great significance is the finding that neither ozone alone nor 1-hexene alone caused growth repression.

P. Heiberger

Since ozonated hydrocarbons are known active components of polluted air, it is only natural that we be concerned with their effect on paint films.

In fact, nothing that I have read in recent years dispels the growing suspicion that more and more of our exterior paint problems stem from trace amounts of contaminants in our air. Despite better materials, a more sophisticated technology, rigid quality control, and superior records, it seems to me that we are frequently finding ourselves with marginal situations where test fence data, accelerated weathering exposures, and actual paint performances fail to show satisfactory correlations. As a result, paint technologists are continuing their frantic search for foolproof formulations.

Unfortunately, a sure-fire environmental testing program is much too complicated, expensive, and uncertain to provide the fast answers desired; and out of necessity this phase of research is doomed to further neglect. In its place, another comfortable round of "easy research" will be instituted. This may involve numerous re-investigations of acid number variations, oil length changes, replacements of oil, resins, polyols, etc., readjusted pigment volumes, pigmentation changes and so on.

Although this easy way is legitimate formulating procedure, it is a far cry from good research. Regardless of the difficulties involved, sooner or later we must seek the true facts, and derive new understandings that will help us deal more effectively with problems of air pollution, as well as other pressing problems.

On Modifying Natural Products

Apparently the more you delve beneath the surface of a seemingly simple process the more you discover unsuspected complications. A case in point is the process of fumigation with ethylene oxide. In practice one simply exposes certain foods to a mixture of gases—ethylene oxide and carbon dioxide. This gas treatment functions as a fumigant, fungicide, and sterilizing agent. Actually this process involves a series of chemical reactions with the ethylene oxide taking a prominent role.

H. T. Gordon *et al.* (*J. Agr. Food Chem., 7*, 196, 1959) fumigated dried prunes with carbon-14 tagged ethylene oxide. The derivatives were isolated and identified as follows: Over 50% of the total radioactivity was combined in the skin as insoluble hydroxyethyl cellulose, 30% of the activity was found in the pulp as hydroxyethylated sugars, and 3% was identified as glycols (mostly diethylene glycol). The remaining activity was found as compounds tentatively identified as hydroxyethylated amino acids and proteins.

In the ethylene oxide treatment, the oxyethylation reactions are probably responsible for the beneficial effects. In many reactions with ethylene oxide, active hydrogens are involved. These may be biologically important sites. The process of oxyethylation must have taken the active hydrogens out of play. The consequence is that the entire molecule becomes somewhat more resistant to normal biological deterioration.

The techniques of treating compounds of natural origin such as gums, starches, and proteins with non-toxic (to humans) modifications are undoubtedly being studied in many places. For example, noted recently is a similar solubilizing treatment, carboxymethylation, which stabilizes proteins against putrefaction. And this is a reaction which may have important paint uses.

U. S. Department of Agriculture scientists L. L. McKinney and E. H. Uhing in a paper "Carboxymethylated Soybean Protein" (*J. Am. Oil Chem. Soc., 36,* 49, 1959) describe the reaction of soybean protein with sodium chloracetate to produce protein derivatives containing added carboxyl groups. This resulted in (1) increased solubility in weakly acid (pH 6-7) solutions, (2) resistance to putrefaction, and (3) stable formaldehyde treated solutions. According to the authors, the most striking property of the carboxymethylated soybean protein is its resistance to putrefaction.

Of course, the obvious adaptations to latex paints were considered. See U. S. Patent 2,788, 336. For example, synthetic latex emulsion paint formulations containing carboxymethylated protein had viscosities of 90-100 centipoises whereas identical paint formulations prepared with the unmodified protein was 70 centipoises. Carboxymethylated protein dispersions treated with formaldehyde failed to affect the viscosity and stability of paints containing the formaldehyde modification. Inoculation of the emulsion paint with a putrefying protein solution did not affect the viscosity or stability over a three month observation period.

Epoxies in Nature

In recent years (*Can. J. Chem., 35,* 358, 1957), a group at the National Research Council, Ottawa, Canada, demonstrated that a small proportion of 12-13 epoxy oleic acid is present as a component of okra seed oil. In continuing this line of research, the same workers, C. J. Hopkins and M. J. Chisholm (*J. Am. Oil Chem. Soc., 36,* 95, 1959) sought the same or similar acids in related seed oils. In preliminary tests, they did find epoxy containing acids in keraf seed oil, a relative of cotton seed and okra seed oils. The estimated fatty acid composition of keraf seed oil is:

1%	hexadecenoic acid
19%	palmitic acid
41%	linoleic acid
30%	oleic acid
2%	stearic acid
5%	epoxyoleic acid

In the future, who knows, paint manufacturers may buy completely formulated epoxy vehicles as a seed oil of specially mutated plants?

Art of Criticism

Depending on the circumstances, criticism can either devastate the receiver or it can inspire him. Psychologists recognize that poorly phrased remarks can discourage initiative, inhibit creativity, and stifle enthusiasm. Therefore the role of the critic is not one to be taken lightly.

Take a situation where a group of men voluntarily and without compensation gather together to participate in some cooperative venture, partly for fellowship and partly to seek insight into mutual problems. If they publish their findings, isn't it more in the nature of a committee report rather than a bona fide scientific contribution? When later and more intensive work uncover errors of commission or omission, would it not seem reasonable to temper criticism? After all, the committee approach accomplished its task for new discoveries are stimulated just as much by the desire to correct, verify, or disprove old work as by the basic need for the information. These thoughts were prompted by reading E. Marsden's paper "Oil Absorption: A New Assessment, Part II" (*J. O. C. C. A., 42,* 119, 1959).

I am sure that the article will provoke a new round of comments, both favorable and unfavorable, but what interested me most was the introduction: "Ten years ago the cooperative experiments carried out by the British Section on oil absorption was reported, together with some theory which was considered to be the basis of the method described in British Standard Specifications. The work was published in full both in England and America and this produced criticism levelled against every feature of the Section's efforts in the cooperative experimental field.

"This was not regarded as a bad thing since, as Cardinal Newman pointed out, no man would do anything worthwhile if he waited until his work was so perfect that it was beyond criticism. Now, after ten years, the work of contemporaries can be reviewed and further work is published."

Unsaturated Fatty Alcohols

No matter how often one is tempted to declare that some branch of technology is fully exploited and devoid of future novelty, some uncooperative scientist will find a new avenue of research—often revitalizing the ailing technology. For example, many of us tend to regard the area of drying oils as thoroughly exploited and awaiting the technological obsolescence pile. Of course, others recognize that the ability of an agricultural crop to renew itself annually is an extremely valuable and vital advantage.

In particular, chemists would undoubtedly find many uses for unsaturated fatty derivatives if such were available in great variety. Unsaturated alcohols, for example, may find wide application if they were available at a reasonable price. Fatty alcohols are usually synthesized by some hydrogenation technique from saturated acids or oils, mainly because present hydrogenation techniques would also hydrogenate the unsaturated portion of the oil. Apparently by control of pressure, temperature, catalysts, and other process variables, it has been possible to carry out specific hydrogenations even in the presence of neighboring easily reducible groups. Since many difficult hydrogenations have been carried out in other applications, it is reasonable to expect that the hydrogenation of unsaturated oils is not outside the realm of possibility.

According to University of Seville researchers J. M. Martinez Moreno, R. Establier Torregrosa and A. Vasquez Roncero, unsaturated fatty alcohols can be prepared by use of high pressures. Writing in *Gassas y Aceites, 9,* 60 (1958) (*C. A., 53,* 1104), they report that unsaturated alcohols are prepared in 97% yields from oleic acid, sulfur olive oil, or the fatty acids from oliver oil by treating with hydrogen at 265° C under 200 atmospheres pressure for 2-3 hours using 10% copper chromite as catalyst and 3.75% cadmium carbonate to protect the double bond. This may be familiar territory to the experts, but I can't help wondering if the more unsaturated oils would respond to similar treatments.

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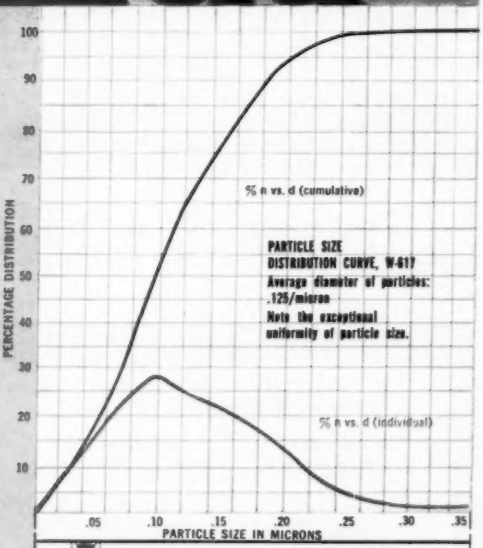

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McWHORTER CHEMICALS CELEBRATES TENTH ANNIVERSARY

McWhorter Chemicals, Inc., Chicago, Ill., is celebrating its 10th anniversary this year. The firm was founded in 1949 as a manufacturer of resins, varnishes, and specialty chemicals adapted specifically to customer needs.

The span from 1949 to 1959 has been an important period in the technological progress of the paint industry. In 1949, latex emulsions were in their infancy. But now, since the early appearance of styrene-butadiene emulsions, emulsions from polyvinyl acetate, acrylics, and alkyds have been marketed. This decade also saw the introduction of epoxies; silicones were finding special applications and uses; isocyanates, polyurethanes, polyesters, and more recently, water-soluble finishes were developed.

In this same 10 year period, alkyds, McWhorter Chemical's most important product, were upgraded and improved upon. For example the introduction of new types of polyols such as trimethylolethane and trimethylolpropane has resulted in alkyds with unique and interesting properties. Also, increasing production of isophthalic acid, sebacic, isosebacic, azelaic, adipic, fumaric, maleic and benzoic acids allows the alkyd chemist a wide choice of basic raw materials from which to tailor-make specialized resins. Another interesting development has been the upgrading of alkyds through monomer modification with styrene or vinyltoluene. More recently, modification with diisocyanates very markedly improved the resistance of alkyds to wear and hydrolysis.

Alkyds were introduced to the paint industry about 35 years ago, and have grown to be the major vehicle for the paint industry. Today alkyds constitute almost half of the more than 800 million pounds of resin used in coatings. Experts in the coatings field feel that alkyds will continue to be the most important vehicle for some years to come. Their flexibility in formulation gives such versatility in performance that alkyds are currently used in a host of different paints and finishes. With the high interest in water finishes, much effort is being devoted to develop satisfactory water reducible primers and finishes based on alkyd resins.

When McWhorter was organized in 1949, trade sales paint makers were using alkyds to improve the quality of architectural paints. Success in this particular application had been very slow, due to the fact that most of the alkyds were being designed primarily for ships, cars, and refrigerators.

The prime effort at MCI was to

112 years of working experience in the paint industry is represented by the McWhorter "Executive Team" from left to right: Charles J. McWhorter, president; Carl Lemcke, vice president and operations manager; Edgar Clark, laboratory director; Norman Baum, factory superintendent; H. Douglas Spruance, sales manager.

Automatic reactor control and recording equipment helps assure uniform quality.

work with new raw materials to make quality alkyds available at a practical cost. Different alkyds, ingeniously designed particularly for architectural paints, were the result.

McWhorter has come a long way since its beginnings. Its present offices, laboratories, warehouse and other technical facilities occupy more than 10,000 square feet in an industrial section on Chicago's southwest side. Above and underground storage can accommodate more than 300,000 gallons of raw materials and finished products.

McWhorter manufactures approximately 25 different types of alkyds for use in both architectural and industrial finishes. These alkyds are manufactured in kettles having a capacity of 1,000—1,500 gallons. Because they provide uniform and safe heat transfer, Dowtherm vapor and electro-vapor systems have been selected by MCI in cooking alkyds and varnishes. Thirty-five workers are employed. Sixty percent of this volume goes into trade sales paints The average production rate is 15 million pounds per year.

Charles McWhorter, president and founder of McWhorter Chemicals, Inc., has many ideas and philosophies concerning the paint industry. Some of these ideas, expounded recently, are as follows:

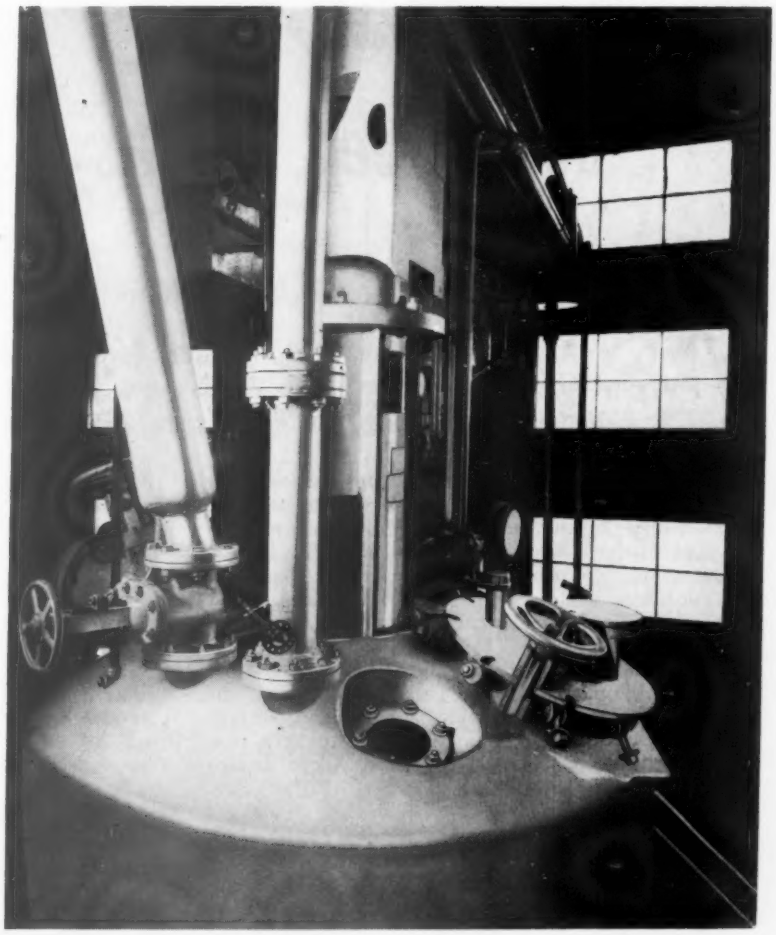
"The middlewestern paint manufacturers for the most part are value buyers. They are not necessarily looking for cheap prices, but insist on quality and product uniformity. There is no doubt that latex paints have been a key stimulator in the growth of paint sales in general — especially to homeowners. But the industry's continuous, concentrated promotion of water bases has actually excluded solvent base paints from the homeowner's mind. In applications where a solvent paint would do the best job, the consumer uses latex simply because he has not been exposed to the value of other paint types. This situation offers our industry a lucrative opportunity. By also educating the public on the advantages of solvent paints, we will not only strengthen their confidence but rejuvenate a major market.

"Paint consumption in the United States should be greater. The paint industry must educate the homeowner on associating pride of ownership with brightly painted residences. Major obstacles to repainting are: high labor costs and contractors that are too busy to do the job when people want it.

"In recent months, there has been some swing back to alkyd and oil finishes for interior applications.

"Polyurethanes are a potential alkyd competitor. If iso-cyanate can be priced competitively with phthalic anhydride, polyurethanes could replace alkyds in many applications—especially in industrial finishes. Another important factor: polyurethane vehicles can be made in the same equipment in which alkyds are synthesized."

Mr. McWhorter sums up his firm's philosophy in this way: "We are an organization old enough and experienced for mature ability—large enough to be able to serve you—small enough to know you and your needs—young enough to be enthusiastic about serving you."



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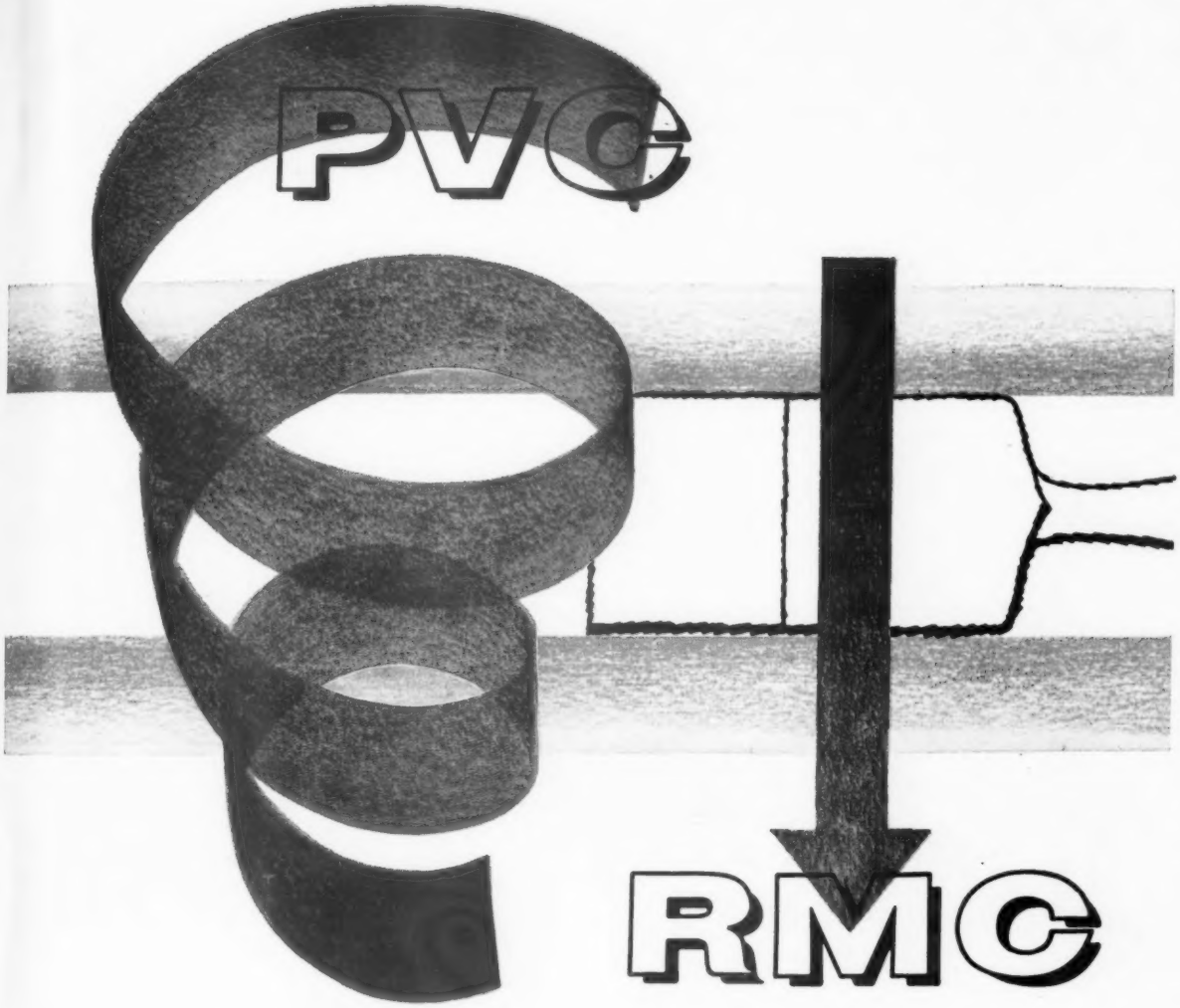

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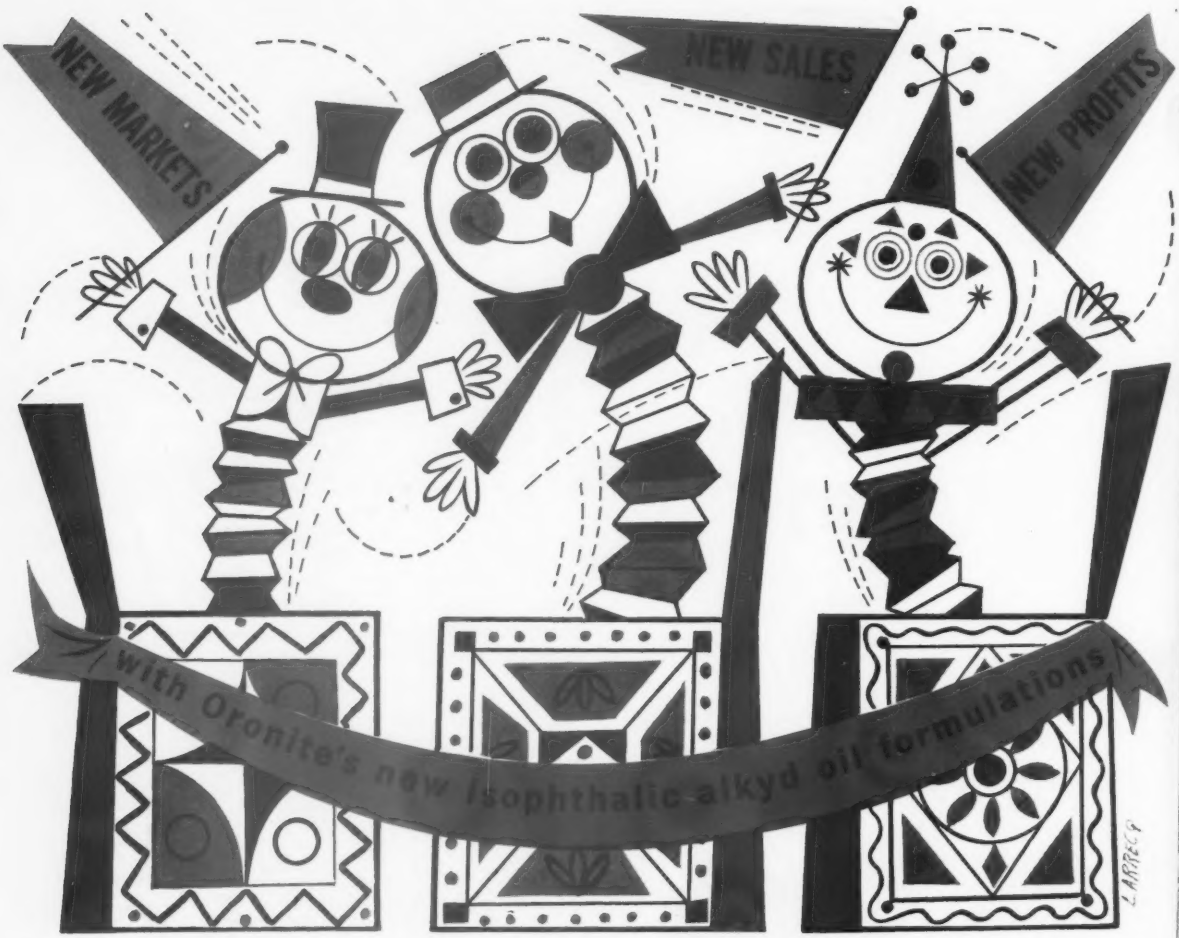

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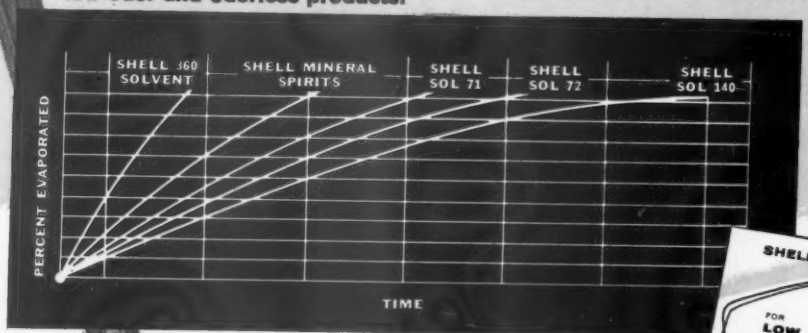

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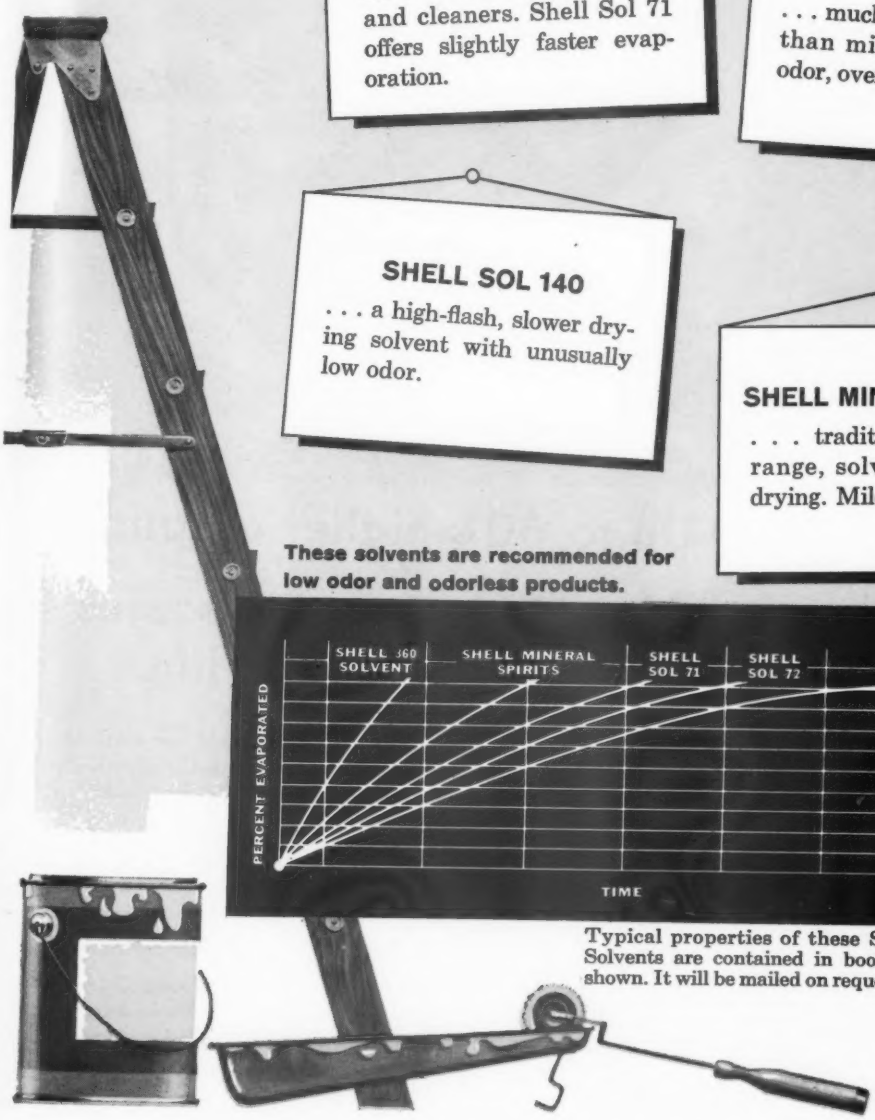

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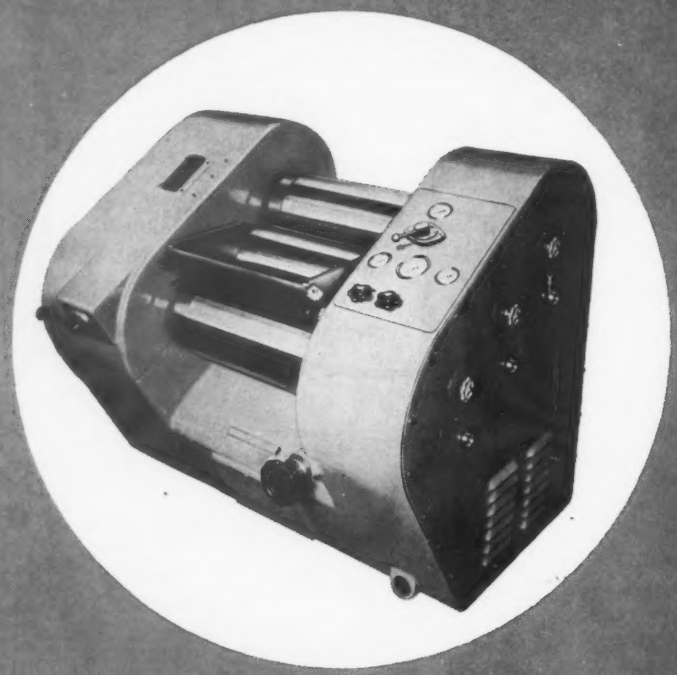

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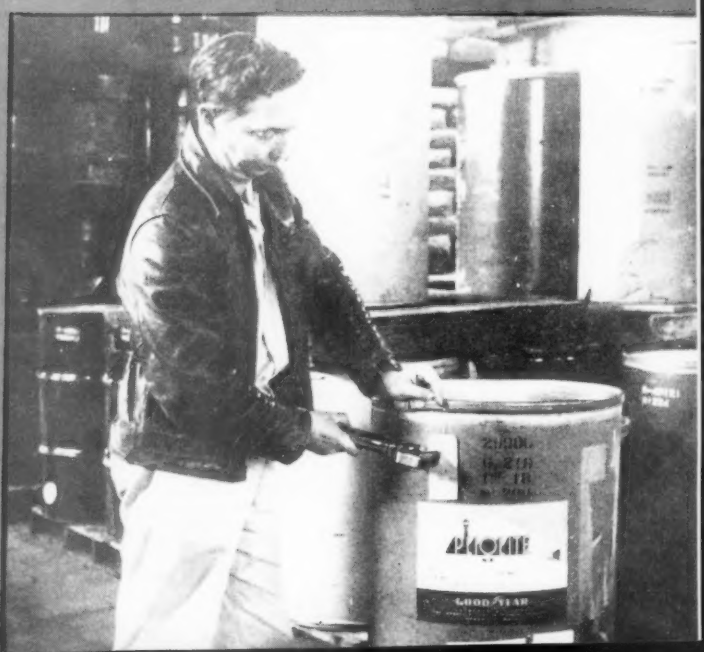
California Ink uses unique system for controlling raw material inventories. Here, the basic information source for inventory control is a tag, attached as shown to each raw materials container that enters the plant. As the container is checked out for use, the tag comes back to the clerk for posting. For details of this system, see page 67.



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CONTROLLING RAW MATERIAL INVENTORIES

California Ink Co. finds Remington Rand Kardex system provides tighter internal controls, better inventory records, more economic ordering, and savings in paper work.

SYSTEMS which establish operating routines in ink, paint and varnish manufacturing plants have a way of becoming the accepted "way we do things around here," says Bob Mohr, supervisor of production, planning and material control of the California Ink Co., Inc., Berkeley, Calif. This is good if the system is good, but it can be just as true of a system which has been outdated by business gtowth or changing conditions—and such a system can be a drain on profits.

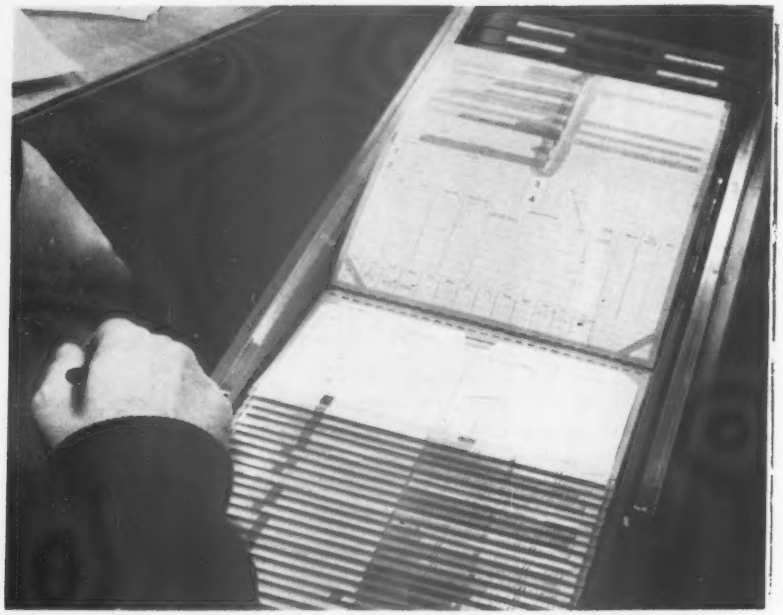
That a periodic re-evaluation of systems can pay off in appreciable savings and operating efficiencies was recently demonstrated at the California Ink Company's manufacturing plant in Berkeley.

Specifically, a second look at a time-honored system for controlling raw material inventories resulted in installation of a new system which gives us tighter internal controls, better inventory records, more economic ordering, and a man-hour saving of 24 hours monthly in paper work. Moreover, our new system has doubled the number of inventory control records a single clerk can control, and has eliminated what was becoming a pressing need for additional personnel.

One clerk is able to control the flow of some 1,000 separate raw material items through our plant at the rate of about 100 orders a week, and ordering is kept current to eliminate the need for any warehousing except for working stocks in the plant. We have yet to create a critical manufacturing situation through a shortage of any raw material since installation of the system. And we now have positive controls against over-ordering as well.

All of this was accomplished at nominal cost. The basic unit around which the system is designed, is a Remington Rand Mobile Kardex cabinet with two simple forms, one a travelling requisition, the other an internal control card.

Left: First step in posting raw materials inventory control cards involves locating Kardex slide containing proper number series, then sliding it into working position. Right: Slide of 63 pockets containing complete records on inventory and usage of 63 different raw materials is easily pulled from position in Remington Rand Mobile Kardex and rolled into working position atop the file.



A close-up look at a slide in the raw materials inventory control file. Signals at lower left of each pocket are moved to right each time a product is used to indicate, at a glance, the last date of use. Signals at the right, on the other hand, indicate the exact quantity of each product used and quantity on hand. When signals on the right reach the visible black line, it is time to re-order. It takes one second, after a slide is in position, to determine which supplies should be re-ordered at any given time.

How The System Works

Our Mobile Kardex has 19 slides, or trays, which can be easily pulled from the file and put into working position atop the cabinet. Each slide holds 60 visible-tip pockets wherein are placed the two forms or cards.

Each pocket is equipped with signals to indicate both inactive supplies, quantities used, and the need for re-ordering. When a delivery is made to our plant, the box, carton, barrel or whatever type container, is tagged by our receiving department. The tag contains the product code, weight of the parcel, and date received. After tagging, the raw material product is distributed to the appropriate storage bins of areas throughout the plant.

When the container is opened, the using department marks its identification on the tag, which is sent to the inventory control clerk. Tags are collected twice daily. The clerk posts the information from the tag to the Kardex also twice daily.

The posting job formerly required thumbing back and forth through cards to post by product. Now, the clerk simply arranges all his tags in numerical order, then pulls Kardex slides and goes directly through one after the other because the pockets are already in numerical order. There is no lost motion going first in one direction, then the other.

The internal control card is a streamlined inventory balance to record receipts, disbursements, and balances.

It is with design of the traveling requisition, however, that we have most noticeably increased efficiencies, both in the manufacturing office and in the purchasing and accounting offices in San Francisco. The "req" replaces a former requisition book, into which our clerk had to write all orders (100 a week). This was a cumbersome form, requiring 60 percent more written material than the "req". Moreover, it was not organized to match purchase order forms in the Purchasing Department and typists there had to hunt first here, then there, to type their orders. It did not have space, nor was there a ready way to provide, information on previous usage.

The new requisition requires only three entries by the Purchasing Department after it leaves our office. These are the supplier number, how shipment is to be made, and whether the price is FOB. In Production Planning, we fill in description, quantity, when needed, using department, price, and amount currently on hand.

At the bottom of the req there is a usage history dating back three years, showing exactly when and how much of this material was ordered previously. This provides a convenient control in Purchasing. Without digging through their own records, they can see what the usage history has been and can better determine whether to take advantage of quantity orders (if a price break is indicated) and whether the manufacturing plant might be over-ordering if the order is not consistant with usage history.

When a re-order is indicated, the req is slipped from its pocket in the Kardex file and sent to Purchasing. Each time a req is sent out, we prepare a file note to slip in the pocket. It advises when the req was sent, quantity ordered, and when delivery is expected.

As the req is received in Purchasing, the buyer has only to make a quick check, make his purchasing arrangements, jot in the three quick entries mentioned above and pass it on to a typist. All information appears in the same order as on our Purchasing Orders, which considerably speeds typing time.

In the left-hand side of the visible edge in each pocket we use a movable Graph-A-Matic signal

The Kardex file, utilized for inventory control, has virtually eliminated overstocking and supplies shortages. Here, Bob Mohr, supervisor of production planning and materials control learns in a second over a Kardex slide the last date a certain product was used. He can also determine at a single glance at this slide which supplies have dwindled to the point a re-order is indicated.

which indicates the last month each product was used. Each time we get a tag indicating use of a product, we simply slide the signal to the appropriate position.

By merely glancing at these signals, we can check on product obsolescence and inactivity. When use of a product tapers off, we can check and determine whether there is no longer need for this product, or just what the story might be.

Recorder Signal

Valuable though this is, it is the Graph-A-Matic signal on the right-hand side of the pocket which saves most time. This is a minimum order signal, which instantly shows when the stock of any raw materials product is reaching the re-order point.

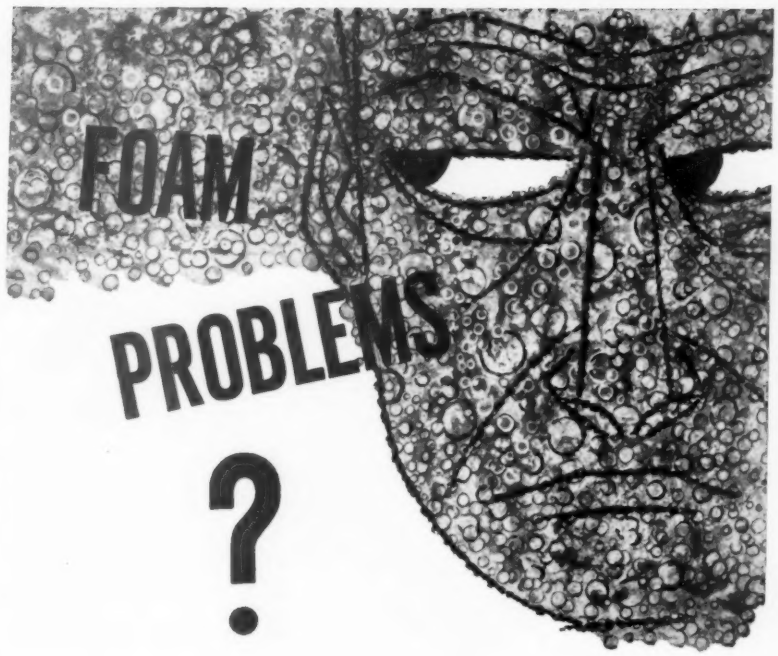
The signals are so arranged that a black line appears from top to bottom of each 60-pocket slide. Anytime one of the signals on any product pocket reaches the black line, it is time to re-order. The visible signal is so effective that a fast glance at all 60 visible edges in a tray is sufficient to tell us whether we need re-order any product filed in that tray.

Here, again, the signal is moved to the right each time we get a tab indicating use of that particular product. Different color signals are used to indicate different quantities.

What we have, then, is an easy to read and maintain file which almost automatically keeps us out of trouble on over-orders and understocking.

We have at our finger-tips a complete product record of raw materials in inventory, use (and non-use) and we have saved both ourselves and the Purchasing Department a great deal of time and trouble. We have made possible purchasing economies through intelligent quantity buying, and we have doubled the volume of work a single clerk can control.

Since posting is much easier, we have saved a minimum of four hours each month in preparing monthly reports pertaining to raw material stocks, usage, etc. This information is readily obtained from the Kardex pockets where, formerly, it was necessary physically to pull cards from a file and hunt for the required information.



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PRODUCTIVITY AND HUMAN RELATIONS

By
Lawrence Shatkin

THE goal of increased productivity is a great challenge which embraces both the physical and social environment. It is not merely increased production through additional man-hours or manpower, but an increment in units per hour due to improved methods, procedures, or work simplification programs.

Productivity Planning

In order to achieve these goals and objectives, a change in thinking is necessary by management and labor. The first and most important principle in any plan for increased productivity is to insist that it be the joint product of employer and employee thinking. Organization is one of the principal factors determining the productivity of labor, and any improvement in managerial performance will cause a rise in productivity.

Within the area of human relations is the relationship of the managers and the managed. Participation by the worker and a share of the benefits of material progress are the two great demands of an industrial labor force. One must follow the other in order to avoid a conflict. To evade these difficulties is a challenge to man's wit.

Evolution

Human relations in industry began with the work of Elton Mayo and his activities, and developed from his classic studies at the Hawthorne Plant of the Western Electric Company.[1] The goal of human relations is to create individuals who can be effective in many groups.

Concepts in Human Relations

The human-relations approach to the problems of industry discloses two extreme relationships. On the one hand, the combination of personalities, groups, organization, and cultures produce conflicts, restrictions, restraints, and mental illness. On the other hand, a diametric reaction emerges from these forces.

From an aggregate of personality traits and patterns, two types deserve mention because of their effect on industrial relations. The first is the authoritarian personality, whose entire actions and mental framework lacks empathy. It leads to serious communication difficulties, which in turn, breeds labor unrest and misunderstanding.

The other personality pattern stressed by human-relationists is the frustration-aggressive pattern.[2] Frustration arises at the job and away. It manifests itself because of a lack of "belongingness" to groups, or because of monotonous jobs lacking in creativity and self-expression. Poor leadership and supervision is a contributing factor to this personality pattern. The consequence is aggressive behavior, which only aggravates rather than solves frustration.

It is hoped that managers will obtain an accurate picture of their own interaction patterns, which will enable them to learn their behavioral strengths and weaknesses, and what to do about them.

Current human-relation princi-

The opinions expressed in this feature are not necessarily those of any particular firm or organization.

1. Elton Mayo, "The Social Problems of an Industrial Civilization," (Boston: Harvard University Graduate School of Business Administration, 1945) and "The Human Problems of an Industrial Civilization," (Boston: Harvard University Graduate School of Business Administration, 1946).

2. Ross Stagner, "Psychology of Industrial Conflict," (New York: Wiley, 1956), pp. 155-196.

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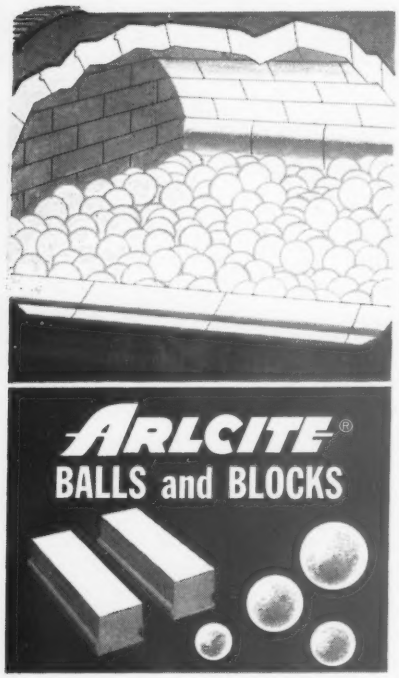

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ples are directed toward decentralization of the corporate structure, which calls for delegation of authority, and wide participation in decision-making. The goals and objectives of a company operating under decentralization are more readily acceptable because they are set by a more immediate group, rather than imposed upon them by central headquarters. The supervisor's role becomes that of being spokesman for his group in its relations with other groups and maintaining and surpassing production standards set by the company. It leads to self-control which enables the supervisor to direct his efforts where they are needed most.

The Scanlon Plan

Mr. Scanlon's initial work took place in the 1930's at the Adamson Company. The plan was introduced as a last measure for saving the company from bankruptcy, and produced amazing results.

Without going into the mechanics of the plan, it can be stated very simply that this plan is a version of profit sharing, which establishes a year where normal labor costs have occurred, and any decrease in costs through employee suggestions and company efficiency is returned to the worker in the form of a monthly bonus. In any event, a relationship must be found between the worker and over-all company productivity. The incentive base is the ratio of cost of all labor to the value of goods shipped.

Concepts

The Scanlon Plan has fostered union-management cooperation. Invariably it has been adopted where both a strong management and union prevailed. The principle of participation has been stressed in the solution of production problems. This includes a willingness on the part of the company to disclose all the facts and figures pertaining to controllable cost factors in order to furnish an objective outline for worker activity. A clear and direct relationship between efforts and returns is established so the employees can really see the effect of their participation in their pocketbooks. It motivates people to work harder to make the plan succeed because they have helped in its formulation.

This plan has stressed teamwork, whereby an experienced man will pass on his skills and techniques to younger men, because this program encompasses all labor, both direct and indirect. It would be unusual to see this concept evolve under piece work, where increased productivity is sought from each individual.

Leadership Necessary

The Plan is no cure-all; it is not a substitute for leadership. It will operate successfully only under good leadership. Leadership assists in the attainment of certain organizational goals. In group relationships the relevant goals unfold through the interaction of the members of the group, and reflect what the group wants to do. The leader must possess a sensitivity to the group's objectives, and use his skill in bringing about its realization.

Use of Committees

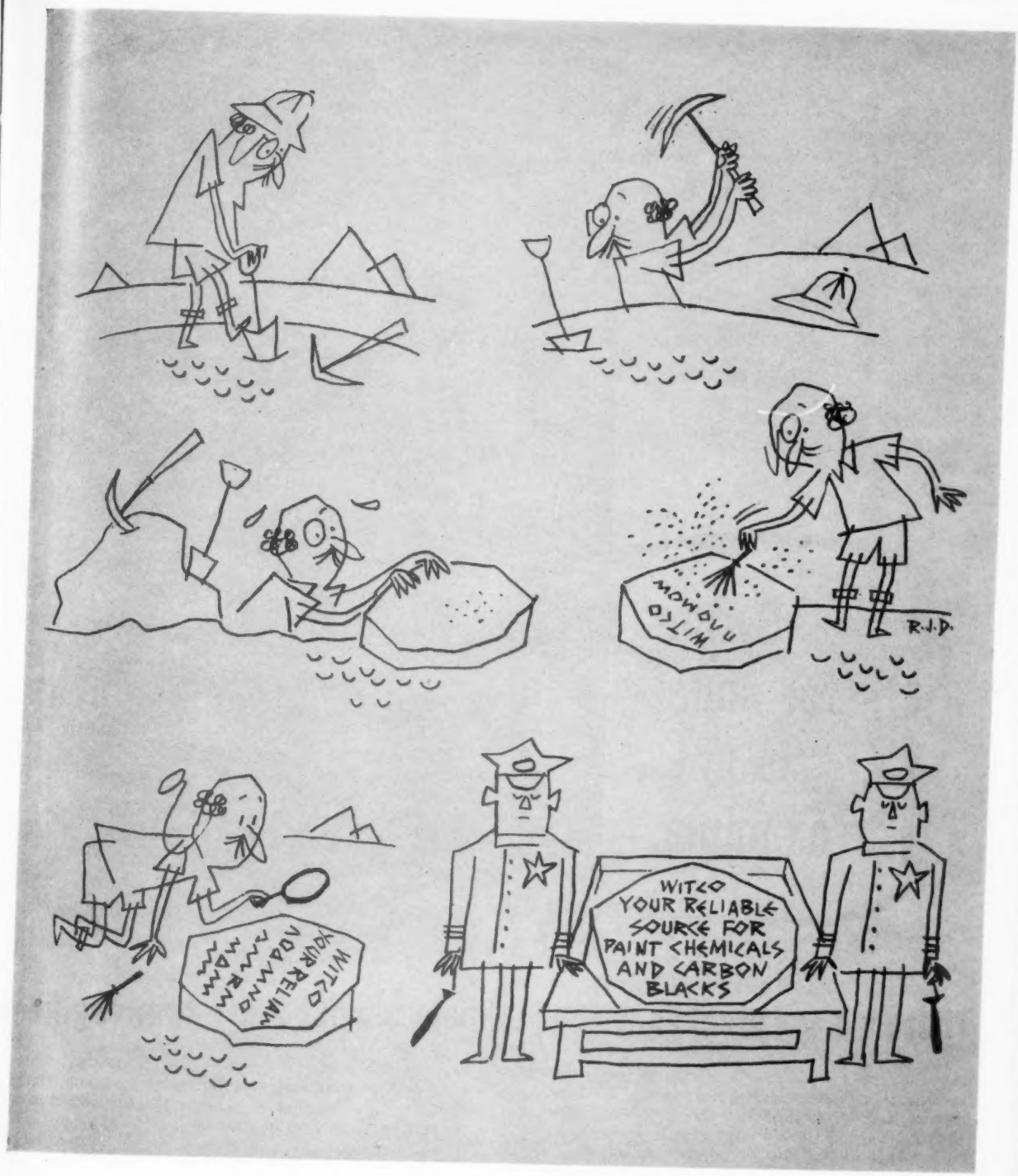
A very interesting aspect of the Scanlon Plan is the strong tendency toward the use of production committees. The idea of participation stems from our cultural background in a democratic climate. This leads to a more humane, dignified treatment of the individual.

The committee meetings form the basis for both criticisms and constructive suggestions for improvements. Every suggestion has to be considered, analyzed, and followed-up. Careful replies must be forthcoming to those that are not acceptable.

Conclusion

It has been established that people are more apt to carry out a decision they have shared in making. It leads to a genuine sense of partnership by both parties. It affords the individual status, recognition, and self-expression.

The objective of integrating the needs of the company with those of its employees is not to devise an organization chart but, rather, to build understanding among the members of the organization—an understanding of what is to be done, who is to do it, and how it is going to be done.



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New Developments

Pigmentation of Urethane Prepolymers

Polyurethane prepolymers, like Spenkel P93-80X and P18-50X, are difficult to pigment because of the presence of highly reactive isocyanate groups. Since both Spenkel P93-80X and P18-50X require the addition of only two-four per cent of an amine type catalyst just prior to use, it is not possible to grind the pigments in the catalyst. Other polyurethane prepolymers like Spenkel P23-75S require the addition of roughly an equal quantity of a hydroxyl-containing material such as a polyester, Castor 1066 or D-I Castor oil, and the pigments can be very easily ground in these materials and the two components mixed just prior to use.

The research and development laboratories of Spencer Kellogg and Sons, Inc. have completed work on a new technique which is believed to be a very practical means of pigmenting prepolymers of the Spenkel P93 and P18 type.

The cause of the instability when prepolymers are pigmented is rather complex. Moisture and many other impurities contained in the other ingredients of the formulation will combine prematurely with the highly reactive isocyanate groups, leading to gassing or gelation in the can or of pinholoing and low gloss in the film. Pigments are the worst offenders, since it is virtually impossible to keep them absolutely dry, and also many of the surface treatment chemicals or minor constituents can react with the isocyanate.

By reacting the moisture and other reactive impurities in the pigments with an isocyanate before introducing the prepolymer, it can effectively remove these contaminants and obtain stable pigmented prepolymers. Many isocyanates are effective, but tolylene diisocyanate (TDI) is suggested because of its availability and relatively low cost.

The procedure developed in the laboratory for successfully pigmenting prepolymers can be outlined as follows:

1. Determine the approximate amount of reactive impurities in the particular pigments employed be running an oven weight loss according to ASTM Method D-280-33. The solvents and any other ingredients should of course be moisture free, or this must also be taken into consideration in figuring the amount of TDI required. Xylol and toluol as solvents are recommended since they are most readily and inexpensively available in moisture free grades.
2. Assume all of the weight loss to be moisture and calculate the amount of TDI required to react stoichiometrically with the water being introduced with the pigments. This can be calculated by the simple formula:
   Weight of TDI required = 9.66 x total weight of water in pigments
3. Charge a ball mill or other *closed* dispersion system with the pigments, enough solvent to make a slurry, and the calculated amount of TDI. Intimately disperse these ingredients for a sufficient length of time to allow all reactions to take place. With the systems studied in the laboratories, the slurry charge was arbitarily tumbled overnight in a ball mill. This is generally more than enough time for the reactions to take place.

   Suitable precautionary measures in the handling of TDI must be taken in accordance with manufacturers' recommendations.
4. Add the prepolymer and grind until the desired degree of dispersion is obtained.
5. Reduce, adjust and package as rapidly as possible, avoiding prolonged contact with the air.

The technical Service Department, Spence Kellogg and Sons, Inc., Buffalo 5, N. Y., has made available a bulletin listing various formulations. Also included in the bulletin is a summary of both organic and inorganic pigments investigated to date in the laboratories by the method described. An extensive table on slurry grinding pigmentation study is also presented.

•

FMC Epoxy Resin Diluent

Food Machinery and Chemical Corp., 161 E. 42nd St., New York 17, N. Y., has introduced a new epoxy diluent.

FMC's octylene oxide is said to be a low viscosity chemical which effectively reduces the viscosity of

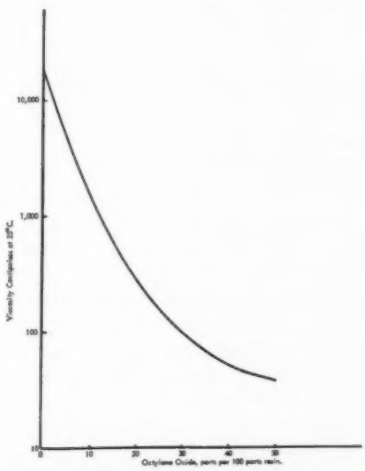


Figure 1. Effect of octylene oxide on viscosity of conventional Bisphenol A—derived epoxy resin.

conventional epoxy resins based on bisphenol A.

Some of the advantages claimed for the lower viscosity resin system are improved workability, higher solid loadings, better wetting, lower exotherm (so allowing larger coatings), and increased pot life.

The effect of octylene oxide on the viscosity of bisphenol A—derived epoxy resin is graphically illustrated in Figure 1.

A typical coating formulation using octylene oxide as a reactive diluent and modifier is as follows:

	Parts by wt.
Epon 1001 (or equivalent)	52.4
Octylene Oxide	5.8
Urea-Formaldehyde Leveling Agent	1.8
Xylene	13.6
Methyl Isobutyl Ketone	13.2
Cellosolve	13.2
Diethylene Triamine	3.6

All the components except diethylene triamine are mixed. The amine is added just prior to use.

The properties of the coating (on steel panel) derived from this formulation are compared with a control containing no reactive diluent in Table I.

Property	System	
	Control	Octylene Oxide Diluent
Pot Life, hrs. (4 gm. batch)	9.5	21.5
Sward Hardness (7 days at room temp.)	3.8	43
Impact Strength, inch pounds	6	22
Flexibility, Mandrel Diameter, in.	0.75	0.37

Table I.

Dispersing Agents Developed by Antara

Antara Chemicals, Dept. PVP, 435 Hudson St., New York 14, N. Y., has announced the development of N-Vinyl-2-Pyrrolidone and N-Methyl-2-Pyrrolidone in pigment application.

N-Vinyl-2-Pyrrolidone is claimed to be completely miscible with water, methanol, ethanol, ethyl acetate, ethyl ether, methylene chloride and hydrocarbons. In compolymer systems it permits the control of solubility characteristics in water and organic solvents and can modify other properties such as dye receptivity, complexing action, emulsifying action, adhesiveness and pigment dispersion.

N-Methyl-2-Pyrrolidone is claimed to be completely miscible with water and most organic solvents. Is high boiling, non-toxic, noncorrosive, low fire hazard, good chemical stability, powerful solvent and dispersing action.

N-Vinyl-2-Pyrrolidone and N-Methyl-2-Pyrrolidone have been found effective as a dispersing agent for pigments for use in lacquers, paints and printing inks and also to impart softness of grinding properties to pigments when ground on the conventional types of grinding equipment.

Under normal conditions pigments used for coloring lacquers must first be ground, usually on a three roller mill, in a suitable plasticizer and then finally dispersed in the lacquer by ball milling for 16 to 48 hours. Both of these mechanical operations are costly to perform and add substantially to the cost of the finished lacquer. By the use of either N-Vinyl-2-Pyrrolidone or N-Methyl-2-Pyrrolidone this mechanical grinding and dispersing is eliminated since only a good electric stirrer and a minimum of ball milling is needed to perform the operation.

A typical example is a nitrocellulose lacquer pigmented with phthalocyanine blue (Heliogen Blue BNC Powder New). This pigment usually requires grinding six passes on a three roller mill with a suitable plasticizer in the ratio of 2 parts plasticizer to 1 part pigment and subsequently ball milling in the lacquer for 36 to 48 hours.

By usingN- Vinyl-2-Pyrrolidone or N-Methyl-2-Pyrrolidone, 2 parts are mixed with 1 part of pigment and stirred for 5 or 10 minutes with a high speed stirrer. The required amount of pigment paste is then diluted with the thinner used in the lacquer formulation, stirred 5 to 10 minutes longer and finally the lacquer is added with continued stirring. The total time elapsed in preparing this lacquer formulation is 30 to 45 minutes compared to 36 to 48 hours which is the normal time required for preparing such a lacquer formulation. A 3 hr. ball milling will further refine the lacquer.

Some pigment and lacquer formulations respond more favorably on storage for 2 to 4 months by the use of N-Vinyl-2-Pyrrolidone instead of N-Methyl-2-Pyrrolidone while in other instances the opposite is true.

Suggested uses based upon dispersion and stability data are listed in Table I.

Pigment paste dispersions prepared in the same manner (1 part pigment to 2 parts N-Vinyl-2-Pyrrolidone or N-Methyl-2-Pyrrolidone) have also proven of value in alkyd solvent type and latex water paints, since both products are water and solvent miscible. In most instances just a mechanical stirring of dry pigment with N-Vinyl-2-Pyrrolidone or N-Methyl-2-Pyrrolidone is sufficient to disperse the pigment for use in paints.

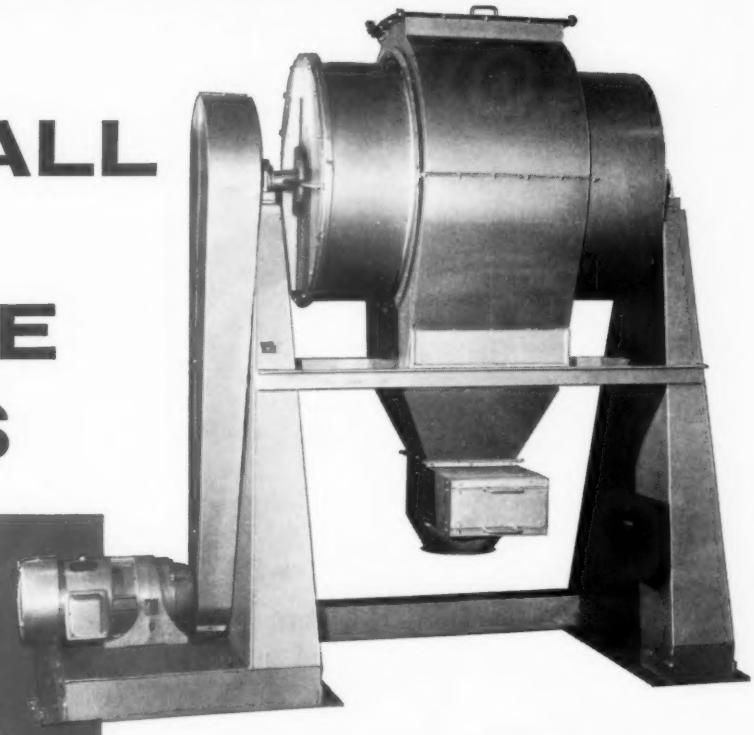
Pigment Type	Nitrocellulose Lacquers	Vinyl Lacquers
Resoform Fluorescent Yellow 3 GPI	N-methyl	N-vinyl
Hansa Yellow 10GD	N-vinyl	N-vinyl
Lemon Ochre Quintuple	N-vinyl	N-vinyl
Pigment Orange M	N-vinyl	N-vinyl
Vulcan Fast Orange GRN	N-vinyl	N-vinyl
Helio Red RMTA	N-vinyl	N-vinyl
Permanent Red RA	N-vinyl	N-methyl
Permagen Red Light	N-methyl	N-methyl
Permanent Red FKB Extra	N-methyl	N-methyl
Permanent Carmine FR Extra	N-vinyl	N-vinyl
Vulcan Fast Red BBE	N-vinyl	N-vinyl
Heliogen Blue BMP	N-vinyl	N-vinyl
Heliogen Blue BNF	N-vinyl	N-vinyl
Heliogen Blue BKA Powder CF	N-methyl	N-methyl
Heliogen Green GA Powder	N-methyl	N-methyl
Carbon Black	N-vinyl	N-vinyl
Titanium Dioxide (Rutile)	N-vinyl	N-methyl

A further recommendation for pastes and lacquers prepared with either N-Vinyl-2-Pyrrolidone or N-Methyl-2-Pyrrolidone is that they be processed and used within a 30 day to 60 day time limit.

Table I.

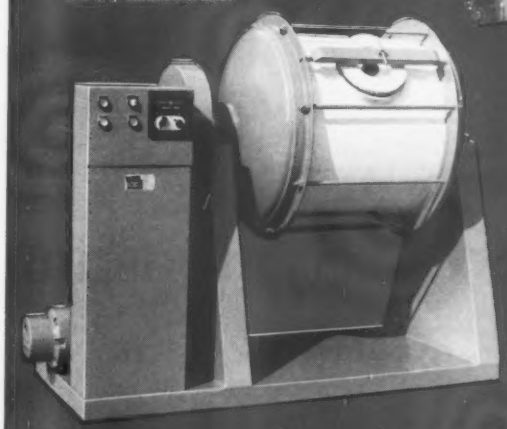
GRIND IT FASTER...AT LOWER COST

with "U.S." BALL and PEBBLE MILLS



210 gallon rubber-lined unit with stainless steel dustless discharge housing, 2-speed motor.

This 52 gallon mill has high density porcelain grinding jar, timer, motor starter, electric brake.



Standard 27 gallon mill with rubber-lined steel grinding drum.

Laboratory, pilot plant or production line... "U. S." supplies Ball and Pebble Mills for practically every grinding job. For low cost, quality controlled wet or dry grinding, you'll find "U. S." Mills unsurpassed in production speed, economical operation and service life.

Sturdy "U. S." units are carefully engineered and ruggedly built for continuous, trouble-free service and ease of operation. Heavy welded steel bases, heavy-duty bearings and precision balanced grinding drums assure smoother, quieter operation. Extra-wide openings speed loading and discharging.

Standard units are available in capacities from 12 gallons up. "U. S." Mills for heavy production requirements are made with steel grinding drums unlined, or lined with rubber, buhrstone, high density porcelain or high alumina ceramic.

HANDY HINTS ON MILLING

Wear on interior surfaces of mill linings will be more evenly distributed, and you'll get longer mill life, by reversing direction of rotation on a regular basis.

For more helpful milling data and complete description of "U. S." Grinding and Mixing Equipment, write for Bulletin 280.

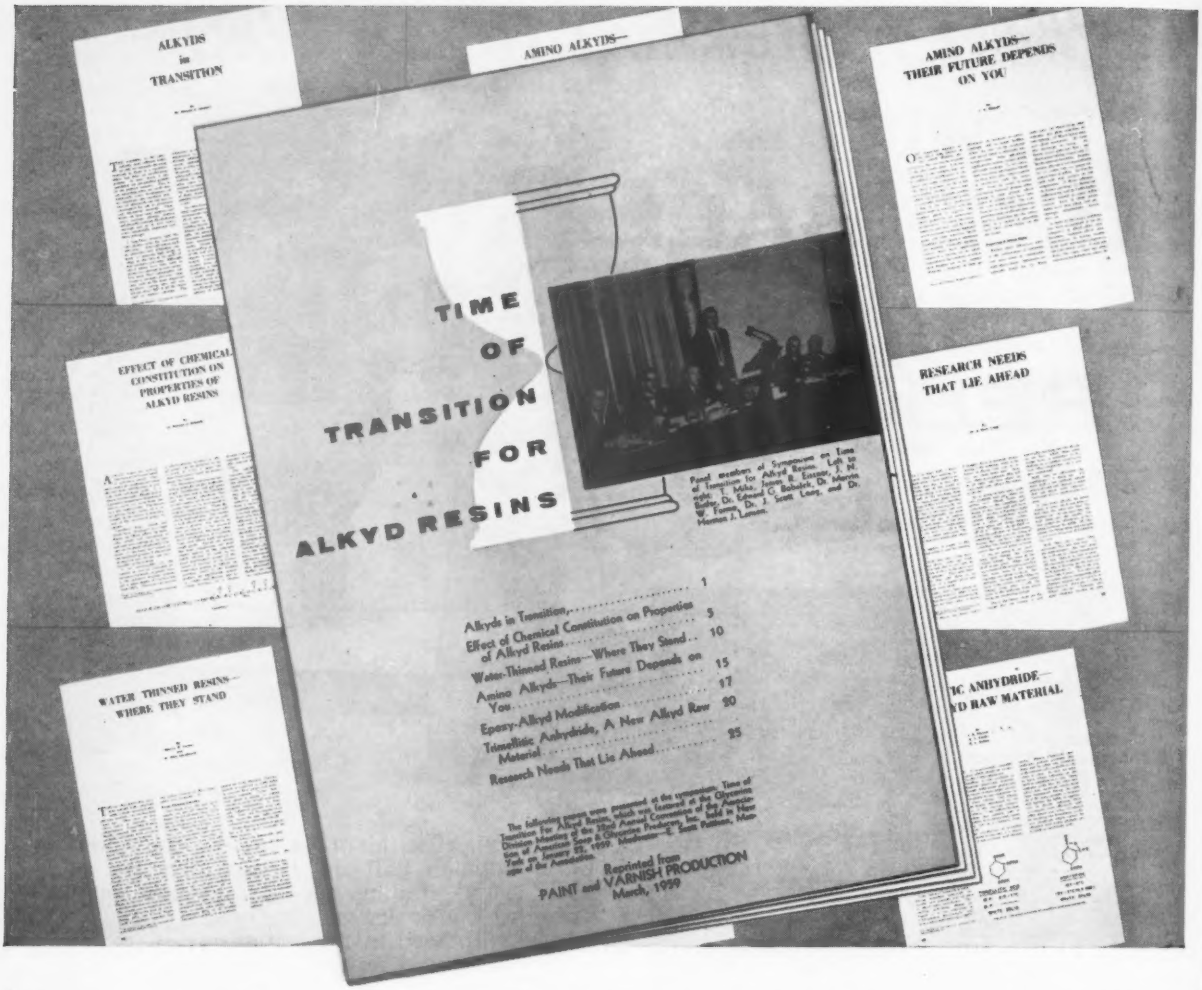
PROCESS EQUIPMENT DIVISION

OUR 100th YEAR

U. S. STONEWARE

AKRON 9, OHIO

447F


ALKYDS in TRANSITION
AMINO ALKYDS—
AMINO ALKYDS— THEIR FUTURE DEPENDS ON YOU
TIME OF TRANSITION FOR ALKYD RESINS
EFFECT OF CHEMICAL CONSTITUTION ON PROPERTIES OF ALKYD RESINS
RESEARCH NEEDS THAT LIE AHEAD
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Reprinted from PAINT and VARNISH PRODUCTION March, 1959

Report from the Glycerine Symposium

"Time of Transition for Alkyd Resins" reflects glycerine's continuing partnership with alkyds. It's a 28-page report by seven paint industry experts of new trends in alkyd resin technology.

Glycerine's versatility is unmatched. It goes to any oil length, permitting polyol inventories to be reduced to a single multipurpose material—glycerine. For the future, glycerine alkyds promise to give coating manufacturers a whole new spectrum of properties to work with.

Reprints of "Time of Transition for Alkyd Resins" are available on request. For your copy, write the Glycerine Producers' Association.

Properties

HYGROSCOPICITY • STABILITY
SOLVENT POWER • VISCOSITY
NONVOLATILITY • NONTOXICITY
TASTE • COMBINING WEIGHT

ADVANTAGES THAT COME WITH . . .

Glycerine

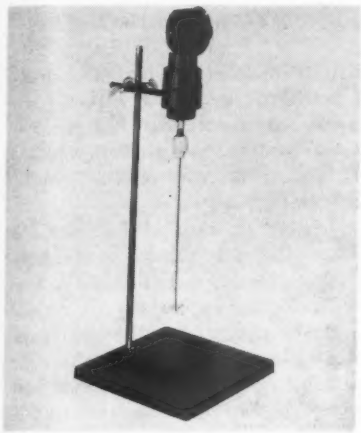
Applications

HUMECTANT • CARRIER
SOLVENT • LUBRICANT
SOFTENER • EMOLLIENT
ANTI-FREEZE • ALKYD BASE

GLYCERINE PRODUCERS' ASSOCIATION • 295 MADISON AVENUE, NEW YORK 17, N. Y.

NEW EQUIPMENT AND MATERIALS

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.



CONSOLIDATED SIPHON

MIXER
Variable Speed

A variable speed lab mixer has been made available.

Equipped with a 1/20 HP motor, it can be set for speeds from 0 to 5,000 RPM. Unit mixes up to 5 gal. of liquid dependent upon viscosity.

Shipped completely set up ready to plug into a 110 V., single phase AC 60 cycle current. Fully adjustable up and down and at any angle.

Terriss Div., Consolidated Siphon Supply Co., Inc., Dept. PVP, 22 Wooster St., New York 13, N. Y.

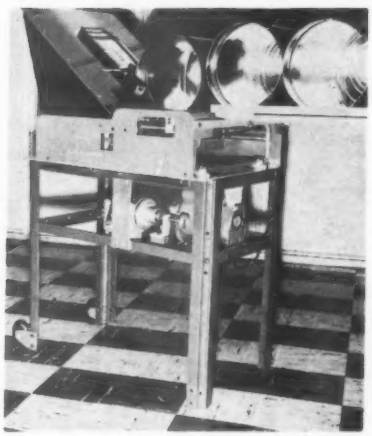
LABELING MACHINE
For Round Containers

A new machine for intermittent labeling of round containers has been developed.

The new features of the 1959 Labelette include a ductor roller that applies a thin, smooth coating of glue; special stabilizing legs that tilt-up onto rolling casters; carefully hardened shaft inserts designed to prevent excessive wear; an open, easier-to-fill-and-clean glue tank; and a newly patented glue film lock.

The new machine handles 1½ oz. containers up to 1 gallon size. It's designed for intermittent labeling as spot, face, or wrap around applications. Overall dimensions said to make possible installation in floor space of only 30 inches x 15 inches.

Labelette Company, Dept. PVP, 216 South Jefferson, Chicago 6, Ill.



LABELETTE

METERING PUMP
Clear & Corrosive Liquids

Model CM chemical metering controlled volume pump, for metering clear and corrosive liquids to chemical processes, has been developed.

Model CM is said to deliver maximum capacities to 28 gph in simplex designs and double that gallonage in duplex designs (two liquid ends with a common motor and base). This pump is constructed to handle pressures to 1, 100 psi.

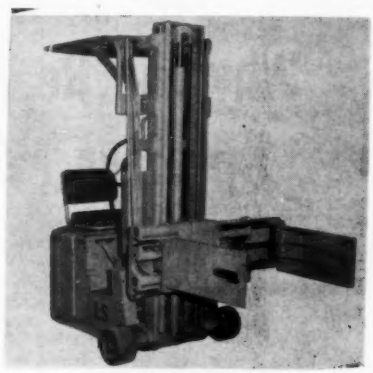
Screwed gland packing provides application flexibility and a choice of materials of construction.

The Model CM features simplified construction for ease of operation and maintenance. Plungers are interchangeable within the pump frame, and models are easily converted in the field from simplex to duplex capacity. Cartridge-type column valves with double ball checks identical on both suction and discharge ports are replaceable at low-cost.

Stroke length, which is 1¼ inches at maximum, is adjustable from 0 to 100 percent of maximum, thereby changing the capacity for the full range of the pump. Capacity is regulated by standard manual T-slot adjustment of the plunger stroke while the pump is stopped.

The Model CM utilizes a standdard drive of ½-horsepower, constant speed electric motor through a right-angle gear reducer. The motor is an open, drip-proof, single-phase, 115 volt, 60 cycle unit.

The Milton Roy Co., Dept. PVP, 1300 E. Mermaid Lane, Philadelphia 18, Pa.



LEWIS-SHEPARD

TRUCK
Bale Grab Arms

A new load grab with bale grab arms is now available.

Said to be ideal for the small warehouse, light duty bale handling operation. The minimum overall truck weight and excellent maneuverability offered by this Model "J" with cascade bale

clamp, makes it suited for operations in old style warehouses where floor loading capacities and maneuvering space often pose major problems.

The bale grab arms are quickly detachable and can be quite easily interchanged with a wide variety of cascade arms, thus making it possible to handle many different types of loads.

Lewis-Shepard Products, Inc., Dept. R9–7–PVP, 125 Walnut Street, Watertown 72, Mass.

HAND LOTION
For Skin Protection

A new protective product is now available for the industrial worker with hands exposed to chemicals, oils, grease, solvents, plastics, and paint.

Applied like any hand lotion, it is soluble in soap and water and protects the hands up to 12 hours. After many tests, it is now being used widely by plastic and chemical industries on the West Coast.

Vanfaire Co., Dept. PVP, 10732 Riverside Drive, North Hollywood, Calif.

OVEN
Large/Small Scale Testing

High temperature oven allows large or small scale testing of volatile and explosive paints with virtually all danger to personnel and equipment eliminated.

ELECTRIC HOTPACK

Built-in safety features include controlled surface temperature heater elements, high velocity blower and specially designed blowout panel mounted on the rear of the cabinet.

Heaters operate at low surface temperatures to minimize the possibility of sample ignition, a major cause of oven explosion.

In the event of sudden pressure rise within the chamber, the rear blowout panel is instantly released into a steel cage on the rear of the cabinet. The door of the oven remains closed to shield personnel and equipment in front of the cabinet from the contents of the chamber. Panel is tightly closed during normal operation to provide a positive chamber seal.

An extra margin of safety is provided by the high velocity blower, which assures channeled air movement essential to safe operation.

Temperature range of the oven is 35°C to 260° ± 0.5° C. Safety ovens are available in both table top and floor models.

Electric Hotpack Co., Inc., Dept. 653-PVP, Cottman Ave. at Melrose St., Philadelphia 35, Pa.

LIFT TRUCK
4000 & 6000 lb. Capacities

A newly redesigned Powerox Model PG electric platform lo-lift truck has been included in the firm's line of powered lift trucks.

With capacities of 4000 and 6000 pounds, the special feature of the PG is its exceptionally high underclearance obtained by the truck's single frame construction and six-

Why the Reardon Company prefers MILTON cans

The Reardon Company uses *lined* MILTON cans for their latex paints. Why does Reardon insist on MILTON cans?

Getting the kinds of cans they want, when they want them, is important to this successful paint firm. They know that whatever types of cans they need —lined, unlined, lithographed, stock or made to order — they get dependable quality and reliable service when they specify MILTON cans.

Producers of paint cans for over 30 years, MILTON has produced *lined* cans for PVA and latex paints since 1951.

Next time you need paint cans, do as the Reardon Company and many other successful paint producers do: order MILTON cans. For prompt service, call EVergreen 3-1100.

GEORGE A.
MILTON CAN CO., INC.
131 North 14th Street, Brooklyn 11, N. Y., EV 3-1100
Our 30th Year

inch full hydraulic lift. By using a specially designed rear axle, only a single frame is used, which eliminates the undercarriage or second frame built into similar type trucks. This makes the PG ideal for moving over steep ramps, with no hanging of the truck at the ramp peak.

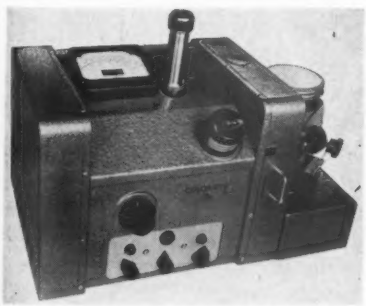
Further, overall length of the PG remains constant whether in raised or lowered position. When the platform is lifted, the special rear axle pivots directly underneath and the single frame rises vertically with no forward motion. When released, the frame lowers vertically with no overall growth in truck length.

The new gear drive is constructed as a single piece unit, with motor, transmission and drive wheel mounted in a vertical column. The gears are totally enclosed, rotating in a bath of oil.

The hydraulic lift mechanism combines motor, pump, overload relief valve and reservoir in a single package unit. An oil filter and electrically operated lowering valve is included. The ram is vertically mounted requiring less force and pressure for lifting. There is no unusual wear on parts, which reduces maintenance.

Pushbutton controls located at operator's fingertips give two speeds forward and reverse, instant lifting and lowering.

Barrett-Cravens Co., Dept. PVP, 628 Dundee Road, Northbrook, Ill.



INSTRUMENT DEVELOPMENT

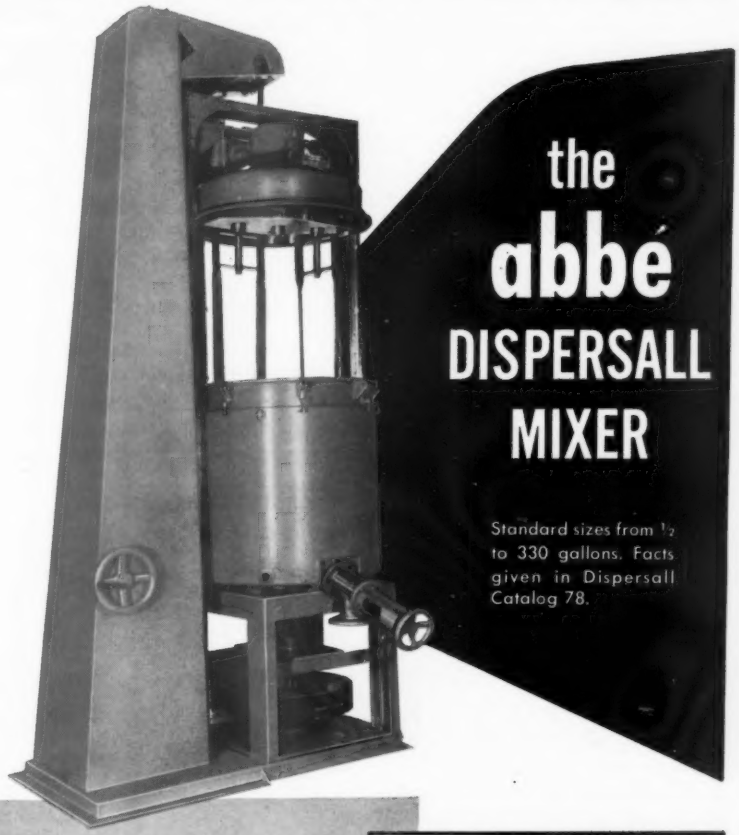
COLORIMETER

Dual-Purpose

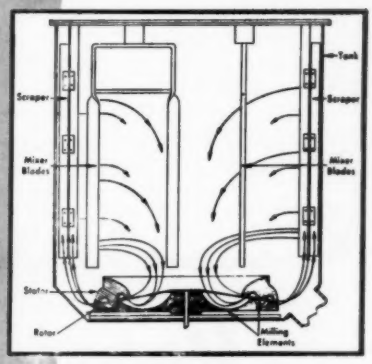
A new model of Color-Eye, the dual-purpose colorimeter and abridged spectrophotometer, has been announced.

The new "Model D" Color-Eye combines the advantages of earlier

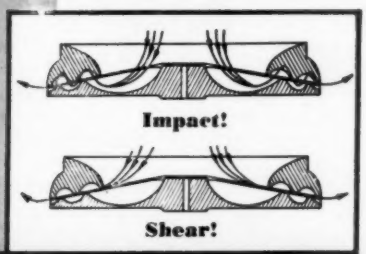
PAINT · VARNISH · LACQUER



FAST, THOROUGH, COMPLETE ACTION!



... BLENDS
DISPERSES
EMULSIFIES
DISSOLVES
MIXES



abbe ENGINEERING COMPANY
620 K Graybar Bldg., New York 17, N. Y.
Designers and Manufacturers of
Ball, Pebble and Jar Mills · Pulverizers · Sifters · Cutters · Mixers

models with several important new features. These features include a "flush sample viewing port" which allows the instrument to be placed against any flat, vertical surface for color measurements.

The optical section contains a new photomultiplier with new, specially matched filters to provide more consistent match to C.I.E. standards. This new optical section improves sensitivity 10 fold and increases the present high sensitivity of the instrument in measuring colors throughout the entire range from very dark to light.

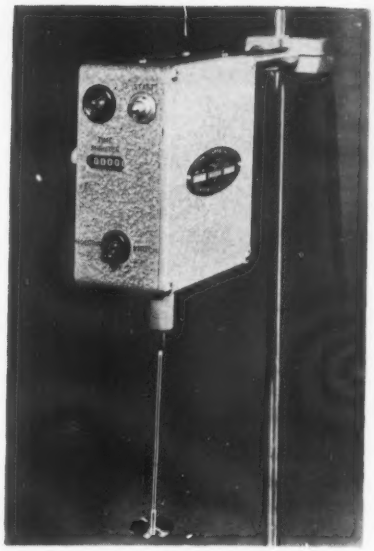
Instrument Development Laboratories, Inc., Dept. PVP, 67 Mechanic St., Attleboro, Mass.

GELATION TIMER
Eliminates Uncertainties

The Tecam Gelation Timer is used for determining the gelation time ("pot-life") of synthetic adhesives, silica sols, drying oils, plastics, and other liquids that gel.

Gelation time is a characteristic of certain substances that is significant in production control, as well as for the subsequent behavior of the material in the customer's hands.

This instrument said to eliminate the uncertainties inherent in subjective tests. It relieves laboratory personnel of a tedious, time-consuming task, and can be lift working overnight and on weekends.



LAPINE

A weighted disc immersed in the resin is subjected to a simple harmonic vertical motion, with a periodic time of one minute, by connection to a geared synchronous electric motor. As the resin sets, a point is reached at which stiffness is sufficient to support the weight of the disc during a thirty-second half-cycle. Up to this point, the connecting link has been under tension during both up and down strokes. As soon as the disc is supported, the link on its down stroke is subject to compression causing an electric contact in the link to close a circuit. This in turn opens a relay irreversibly, stops the synchronous motor, and lights a small neon lamp to attract attention.

Arthur S. LaPine and Company, Dept. PVP, 6001 South Knox Avenue, Chicago 29, Ill.

PROPORTIONING PUMP
For Metering of Liquids

High pressure, low capacity, variable volume, reciprocating plunger pumps. Used for feeding as little as 1.5 gph to as much as 108 gph of corrosive or non-corrosive liquids into chemical processes, water treatment systems and other applications where extreme accuracy and long pump life are requirements.

Standard construction is said to equal the heavy duty models of competitive makes. The pumps

COVER THE EARTH

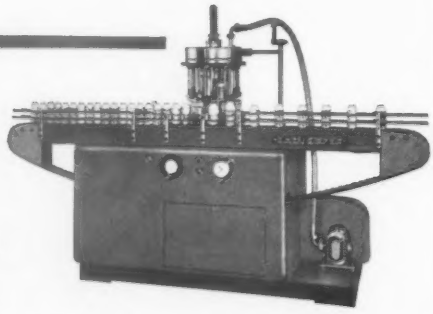
THE SHERWIN-WILLIAMS CO.

Covers the Earth in rapid time, with paints filled can after can by Kiefer.

The Kiefer Cadet Model Vari-Visco Filler does its job neatly and accurately without a drop of drip.

For AEROSOL charging, you can name the speed KIEFER has the right size machine for your needs.

THERE ARE KIEFER FILLING MACHINES TO SATISFY YOUR EVERY REQUIREMENT



Kiefer

CADET MODEL VARI-VISCO FILLING MACHINE

With automatic feed and discharge conveyor—handles paints, varnishes and oils to perfection. "Bottom-up" fill gives viscous materials a solid volumetric pack. . .also a liquid fill, without splash. . .TINS, POLYETHYLENES, AEROSOLS.

The Karl Kiefer Machine Co.
933 MARTIN STREET CINCINNATI 2, OHIO
NEW YORK • BOSTON • CHICAGO • SAN FRANCISCO • PHILADELPHIA
HOUSTON • VANCOUVER • SAVANNAH • LOS ANGELES • LONDON, ENGLAND

are said to normally handle pressures to 625 psi and several thousand psi with special construction, and are available in 304 and 316 stainless, Hastelloy, Carpenter 20 and other steels and ceramic plungers when corrosive liquids are to be metered.

Accuracy is maintained through double suction and double discharge ball checks and seats which have long life since the design eliminates excessive spinning of the balls, seat wear and pockets where harmful deposits may build up. Manual or automatic adjustment of the stroke can be made from 0 to full stroke while the pump is in operation through a special stroke control mechanism.

Walter H. Eagan Co., Inc., Dept. PVP, 2336 Fairmount Avenue, Philadelphia 30, Pa.

PUMP

Air-Operated

A new air-operated, reciprocating type stainless steel pump has been developed. This pump, called the "Pogo SS", is designed for the pumping and transferring of materials direct from the original 55-gallon containers, without costly spillage and waste, to the point of application.

Pump claimed to specifically answer the handling problems of fluids that might be contaminated.

Lightweight, the "Pogo SS" weighs less than 20 pounds and is space-designed with the air motor and pump sections completely separated eliminating the possibility of material entering the air motor or other critical parts.

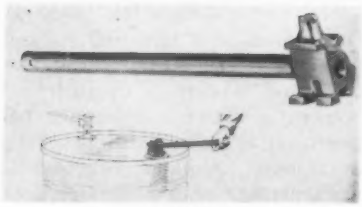
The pump delivers from three to five gallons of material per minute and delivers on both up and down strokes assuring the utmost in economy of operation and longer maintenance-free life. Air motor piston cups are self-oiling and never require lubrication.

Binks Manufacturing Co., Dept. PVP, 3122 Carroll Avenue, Chicago, Ill.

DRUM PLUG WRENCH

7 Projections—5 Slots

A drum plug wrench which will fit over 95% of all popular bungs on the market has been announced.



MORSE

The wrench is available in safety bronze as well as special steel alloy. Seven projections and five slots conform to the various bungs.

Light in weight and well balanced. A 16" steel tube handle gives adequate leverage to open either the ¾" or 2" bung.

The Model #61 wrench is used to remove bungs from non-volatile fluids and the Model #61M bronze non-sparking wrench is designed for hazardous areas. Either model is now available.

Morse Manufacturing Co., Inc., Dept. PVP, 727 West Manlius St., East Syracuse, N. Y.

HAND PROTECTION

In Aerosol Package

The development of a new type of hand protection in an aerosol package has been made available.

Called Protex-A-Hand, the new hand protection is designed for workmen to keep hands clean and germ-free and to prevent dirt, grease and other grime from clogging in the pores, in addition to cutting the daily washing time.

Made with lanolin and glycerine, it comes from the aerosol can in foam cream form and is

Everybody talks about the Weather

But now you *can* do something about it, as it affects your product, with the Atlas Weather-Ometer.®

Weathering durability and color fastness is a major problem in developing a new paint product. Reliable answers to a new product's resistance to weathering can be obtained with speed and accuracy in the Atlas Weather-Ometer. Test programs can be exactly duplicated at any time to give accurate comparative data of various formulas.

For quality control in production—the Weather-Ometer is useful in maintaining the quality standard of the product, by checking each batch run for any deviation from the established weathering and light fastness standards.

A positive control of specimen temperatures greatly increases the accuracy of test results. Automatic humidity control up to dew point is available as optional equipment.

Both horizontal and vertical testing is available. Shallow containers are used for semi-liquid material and vertical panels for solids.

Write for complete Weather-Ometer catalog.

All automatic controls including complete voltage controls are located on the front panel above the test chamber door. Source of light is two Atlas enclosed violet carbon arcs.

Sales representatives in principal cities throughout the world.

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WEATHER-OMETERS® • FADE-OMETERS® • LAUNDER-OMETERS®

rubbed right into the area to be protected.

Acrolite Products, Inc., Dept. PVP, 106 Ashland Ave., West Orange, N. J.

MIXER

Two Rotating Impellers

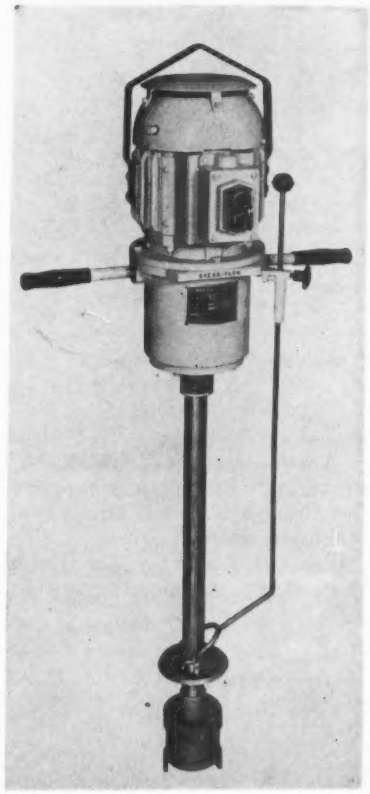
New Model RL Shear-Flow industrial mixer has been announced.

Incorporating many new features, the new Shear-Flow has proved, performance-wise, it is claimed, to be the fastest, most effective and economical means of achieving complete and thorough dispersing, blending and homogenizing.

Shear-Flow's new RL Hi-Shear Head consists of two rotating impellers and two stationary stators enclosed within a cylindrical housing. The fine clearance between impellers and stators results in a more complete reduction of agglomerates within the mixture.

The versatile feature of the new Hi-Shear Head is that it can be powered with motors ranging from two to ten horsepower depending on the power requirement demanded by the application. Larger heads and horsepower ratings will also be available. Motor and mixing head changes can be made in a few minutes on the spot, cutting non-productive down-time to a minimum.

Gabb Special Products, Inc., Dept. PVP, Windsor Locks, Conn.



GABB PRODUCTS

FLUORESCENT PIGMENTS

Greater Brightness

A new line of Hi-Viz fluorescent pigments now available.

Said to be laboratory and field tested for many months. Finer and more uniform particle size and increased resistance to solvents and plasticizers claimed.

Eight brilliant colors are available: Pink, Red-Orange, Green, Yellow-Orange, Red, Lemon-Yellow, Cerise-Red and Gold-Yellow. Company also formulates Hi-Viz pigments in Red-Orange and Yellow-Orange. The Red-Orange and the Yellow-Orange are used to make coatings meeting requirements of MIL-P-21563 (AER) and MIL-P-21600 (AER).

Pigments may be used, for toning non-fluorescent colors to produce new and brighter shades of regular paint lines. Hi-Viz pigments are said to be compatible with most vehicles.

Lawter Chemicals, Inc., Dept. PVP, 3550 Touhy Avenue, Chicago 45, Ill.

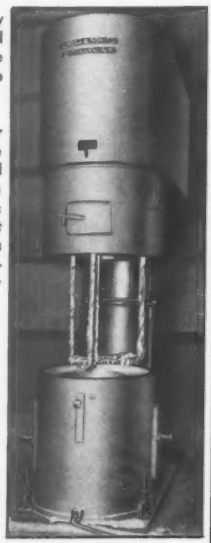
FOR PROPELLANT---OR PLASTISOL*?

ROSS DOUBLE PLANETARY

Change Can Mixers give better mixing in less time!

At *Thiokol*® solid propellant plant in Elkton, Md., this Ross #130CDM variable speed 100 gallon Mixer produces the **same high quality mix as obtained in Horizontal Double Arm Kneaders,** and **in ⅓ the mixing time.**

With no bearings or stuffing boxes in the product zone, stationary can, completely enclosed mix, and remotely controlled raising and lowering device, the Mixers are as safe in operation as they are efficient. Mixers have low original and maintenance cost, are easy to clean, and extremely versatile in operation.



Lower illustration shows an 85 gallon #130CDM Double Planetary Change Can Mixer furnished a leading concern for mixing plastisols of several types ranging up to 200,000 centipoises. Customer reports Mixer in operation 24 hours/day with mixing time per batch only 15-20 minutes; while the quality of mix and dispersion is so high that the final product is obtained in the Mixer alone—without further processing through a Three Roll Mill as was previously necessary with other Mixers.

Jacketed cans for heating or cooling material during mixing, dolly trucks, gates on cans for discharge, and vacuum tight covers can be provided.

***---or any other heavy paste material. On paints, inks, pharmaceutical products, caulking compounds, and other similar materials, the Ross Double Planetary Change Can Mixers mix and disperse up to 30 times faster than other Mixers.**

Mixers available in 1, 2, 3, 4, 6, 8, 12, 20, 25, 65, 85, 125 and 150 gallon sizes. Write for complete information on these or other types of Ross mixing, grinding or dispersing equipment!

CHARLES ROSS & SON CO., INC.

Leading mfgrs. of *wet or dry grinding Mills, Kneaders and Mixers* of all types — since 1869.

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PLAUTUS

The assurance of profit is best realized when the price of the product purchased reflects the right combination of quality, service, and performance.

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SP59-2

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HERCULES POWDER COMPANY
INCORPORATED
WILMINGTON, DELAWARE

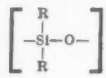
PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Organopolysiloxane Emulsion

U. S. Patent 2,881,146. Norman A. Remer, Pasadena, Tex., and Ralph Aarons, Wilmington, Del., assignors to E. I. du Pont de Nemours & Co., Wilmington, Del., a corporation of Delaware.

A composition for applying to hydrophilic, soilable surfaces to impart both water repellence and resistance to soiling thereto, the comprising (*a*) an aqueous emulsion having a pH of 3 to 9 and a dispersed phase consisting of an organopolysiloxane having a repeating structure of the formula



where R is selected from the group consisting of hydrogen, phenyl, benzyl, and alkyl groups of up to 14 carbon atoms, (*b*) a catalyst for promoting polymerization of the organopolysiloxane, said catalyst being selected from the group consisting of organic peroxides, metal salts of fatty acids, and N-mono-and di-substituted alkyl amides, and, (*c*) colloidally dispersed in the composition, dense, discrete amorphous silica particles averaging 3 to 150 millimicrons in diameter, the composition containing from about 0.5 to 10 percent by weight of the polysiloxane solids, about 0.5 to 5 percent by weight of the amorphous silica, and about 0.1 to 5.0 percent by weight of the polymerization catalyst.

Flame Resistant Composition

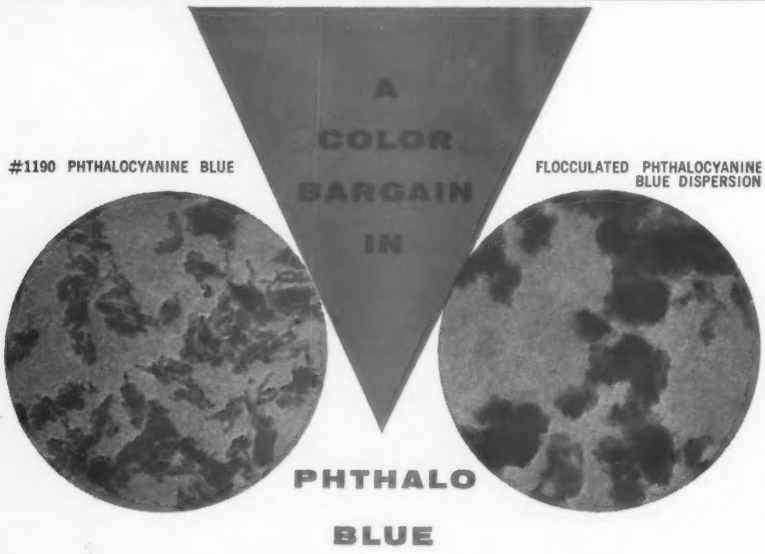
U. S. Patent 2,885,380. Vito D. Elarde, Schiller Park, Ill., assignor to Western Electric Co., Inc., New York, N. Y., a corporation of New York.

A flame resistant composition comprising by weight one and one-half parts of a highly chlorinated polymerized polyester resin prepared from hexachloroendomethylene tetrahydrophthalic acid, a mixture of glycols selected from the group consisting of ethylene glycol, diethylene glycol, and propylene glycol, a compound selected from the group consisting of maleic anhydride and fumaric acid and styrene, the hexachloroendomethylene tetrahydrophthalic acid being present in an amount of from 36 percent to 43 percent based on the total weight of the polyester components; one part of an inorganic flame retardant composed of an oxide selected from the group consisting of bismuth oxide, arsenic oxide and antimony trioxide; four parts of an epoxide resin formed by reacting 45 percent to 70 percent bivalent phenol with 20 percent to 43 percent epichlorohydrine and one part of an amine selected from the group consisting of ethylene diamine, metaphenylene diamine, piperidine, trimethylene diamine, and guanidine.

Production of Drying Oils

U. S. Patent 2,885,297. Kurt Hans Reisinger, Stockholm, Sweden, assignor to Richard Nilsson Aktiebolag, Stockholm, Sweden, a corporation of Sweden.

A method of producing film-forming drying oils comprising the steps of preparing a first solution by dissolving, in an inert hydrocarbon solvent, at least one organic carboxylic acid having from 8-20 carbon atoms and being selected from the group consisting of saturated fatty acids, unsaturated fatty acids, and carbocyclic fatty acids; preparing a second inert hydrocarbon solution of an enolic aluminum compound obtained by reacting an aluminum alcoholate whose alcoholic component is selected from the group consisting of a butylate, an amylate, and a hexylate with an enolic compound selected from the group consisting of diketones, diketocarboxylic acid esters, malonic esters, ketoaldehydes, beta keto esters and acetone, mixing the first solution with a quantity of the second solution containing a substoichiometric amount of aluminum with respect to the acid in the first solution said substoichiometric amount being approximately two molecules of carboxylic acid from said first solution to one atom of aluminum from said second solution, the quantity of said



R-B-H #1190 is an improved, flocculation-resistant dispersion of phthalocyanine blue in nitrocellulose. Its tints with TiO_2 are clean, and 15% to 20% stronger than those provided by conventional phthalocyanine blue dispersions.

Write for your sample.

R-B-H Dispersions

INTERCHEMICAL CORPORATION
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HAWTHORNE, New Jersey

Pigment dispersions in nitrocellulose; ethyl cellulose; urea formaldehyde; vinyl and alkyd resins; chlorinated rubber and other plastic binders.

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second solution based upon the acid number of said first solution and the aluminum content of said second solution, and heating at a temperature above 100° C. to about 135° C. the mixture to bring about a condensation between the acid and the aluminum enolate free from water and of substance capable of generating water during the condensation.

Coating Composition

U. S. Patent 2,885,295. Harold A. McCord, Los Angeles, Calif., assignor to MLLK Corp., Los Angeles, Calif., a corporation of California.

An aqueous coating composition consisting essentially of from about 1 to 90% by volume of a water-soluble soap, from about 1 to 90% by volume of a water-insoluble soap, sulfur in an amount not over 10% by volume, and an inert filler in an amount not over 80% by volume.

Phenolic Resin Varnish

U. S. Patent 2,885,386. Cyril J. Straka and William C. Weltman, Pittsburgh, Pa., assignors to Westinghours Electric Corp., East Pittsburgh, Pa., a corporation of Pennsylvania.

A phenolic resin varnish having a negligible amount of unreacted ingredients and polymeric material of low molecular weight comprising the reaction product of only phenol and formaldehyde in the proportions of 1.0 mol of phenol and from 1.0 to 1.25 mols of formaldehyde, the reaction being carried out in two stages, the first stage comprising reacting the mol of phenol with from 0.4 to 0.85 mol of formaldehyde in a closed reaction vessel under reflux conditions for a period of time of from 15 to 60 minutes, the reaction being catalyzed by an acid selected from the group consisting of sulfuric acid, phosphoric acid and hydrochloric acid in an amount from about 0.1% to 0.4% by weight, based on the weight of the phenol, the second stage of the reaction comprising reacting with the reaction products of the first stage a sufficient amount of formaldehyde to provide a total of from 1.0 to 1.25 mols of formaldehyde per mol of the phenol by refluxing for a period of time of from 30 to 90 minutes, applying a vacuum at the end of the refluxing to remove water from the reaction product the reaction of the second stage being catalyzed by an alkaline catalyst selected from the group consisting of alkali metal oxides and hydroxides and alkaline earth metal oxides and hydroxides in an amount of from about 0.25% to 1.0% by weight, based on the weight of the phenol, and a solvent for the reaction products, the solvent and reaction products combined to produce a liquid phenolic resin varnish.

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improves output and reduces cost

No engineering detail has been overlooked to make this modern Mixing and Kneading Machine the most efficient and economical in its field. For the intensive and uniform mixing of highly fluid, viscous and pasty materials it is unsurpassed.

The planetary action is uniquely effective. Two mixing spindles equipped with helically arranged vanes move along the tank wall while rotating at high speed around their own axes. The mixing mechanism is raised and lowered automatically.

Swivel, tilting, run-out or stationary tanks are provided in capacities from 1 to 350 gallons. The use of several tanks permits almost continuous production. The machine is available in several types and power specifications. Stainless steel or other metals are obtainable if required. The unit can be cleaned quickly when frequent changes are desired in shade or type of product processed. Maintenance costs are unusually low.

Write or telephone for prices and further information.

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J. M. LEHMANN COMPANY, Inc.

550 NEW YORK AVENUE, LYNDHURST, N. J.

Binder For Coating Surfacing Materials

U. S. Patent 2,886,458. Marcel Ceintrey, Paris, France, assignor to Societe Chimique et Routiere de la Gironde, Paris, France, a French body corporate.

A binder for coating surfacing materials, comprising a direct aqueous emulsion of a mixture of tar and asphalt consisting of 30 to 60% tar and 70 to 40% asphalt, said mixture of tar and asphalt containing a cationic aminic emulsifying agent, which is substantially neutralized by a mineral acid, said emulsifying agent being at least one compound selected from the group consisting of amines having the following formulae:

$R—NH_2$

$R—NH—R'—NH_2$

$R—CO—NH—R'—NH_2$

$R—NH—(CH_2)n—OH$ and

$R—NH—R'—NH—(CH_2)n—OH$

in which

n is an integer selected from 1 to 6 inclusive

R is a straight chain alkylenyl radical having 10 to 20 inclusive carbon atoms, and

R′ is an alkyd radical having 1 to 4 inclusive carbon atoms.

Crack Sealing Compound

U. S. Patent 2,885,296. Artie L. Welden, Canby, Oreg., assignor of twenty-five percent to Claude A. Taylor, twenty-five percent to Ivor C. Neiland, and twenty-five percent to Ben Cropper, all of Canby, Oreg.

A composition for stopping leaks in radiators which in passing from a water chamber through a crack in the wall of said chamber forms a resilient plug within said crack, said plug defining interlaced fibers and embedded powder, which plug is adhesively bonded to the sides of said crack and is shielded by a scale bridging the entrance thereto, said composition, consisting essentially of approximately one liquid pint of waterglass, one ounce by weight of powdered asbestos, one ounce by weight of finely ground charred bonemeal, and then drops of liquid sal ammoniac.

Sealing Composition

U. S. Patent 2,886,457. Henry C. Zweifel, Whittier, Denver H. Hull, Anaheim, and William C. Hart, Long Beach, Calif., assignors to Reichfield Oil Corp., Los Angeles, Calif., a corporation of Delaware.

A composition consisting essentially of a homogeneous stable mixture of about 25 to 80 weight percent of a mixture of inorganic fillers, about 3 to 30 weight percent of a raw drying oil, about 10 to 30 weight percent of bodying oil nonreactive with said inorganic fillers and about 5 to 30 weight percent of a stabilizing emulsion, said stabilizing emulsion consisting essentially of water dispersed in a non-drying polymerized polyolefinic glyceride solvent extracted from bodied marine oil, about one part of water being present for each 4 to 20 parts of glyceride.

Thermosetting Coating

U. S. Patent 2,887,458. Cornelius G. Fitzgerald, Ann Arbor, Mich., and Asaf A. Benderly, Washington, D. C., assignors to the United States of America as represented by the Secretary of the Army.

A film forming mixture which is capable of solidifying upon cooling a few degrees below the melt temperature thereof, said mixture consisting of: a major proportion of epichlorohydrin-bisphenol reaction product having low viscosity; a minor proportion of a mixture consisting of approximately equal amounts of N-(B-hydroxyethyl) 12-hydroxystearamide and hydrogenated castor oil; and a minor proportion of triethanolamine, the proportion of triethanolamine being approximately the same as that of the combined mixture of N-(B-hydroxyethyl) 12-hydroxystearamide and hydrogenated castor oil.

Aqueous Coating Compositions

U. S. Patent 2,887,399. Herbert B. Rickert, Midland, Mich., assignor to The Dow Chemical Co., Midland, Mich., a corporation of Delaware.

An aqueous coating composition consisting of between 2 and 75 percent by weight of a mixture of coal acids and starch, said ingredients being in proportions ranging between 10 and 90 percent by weight of the coal acids and between 90 and 10 percent by weight of the starch, the starch being in gelatinized form, the balance being water.

NO **settling!**

NO **sagging!**

THIXCIN® R and M-P-A®, Baker additives developed for your specific purpose, come closest to insuring perfect paints. They are unsurpassed for sag resistance and non-settling. And they insure easy brushing and flow control.

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THIXCIN R and M-P-A were developed solely by Baker. No other additives are backed by the same know-how, experience and service. Ask the paint man who uses them.

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Bayonne, New Jersey

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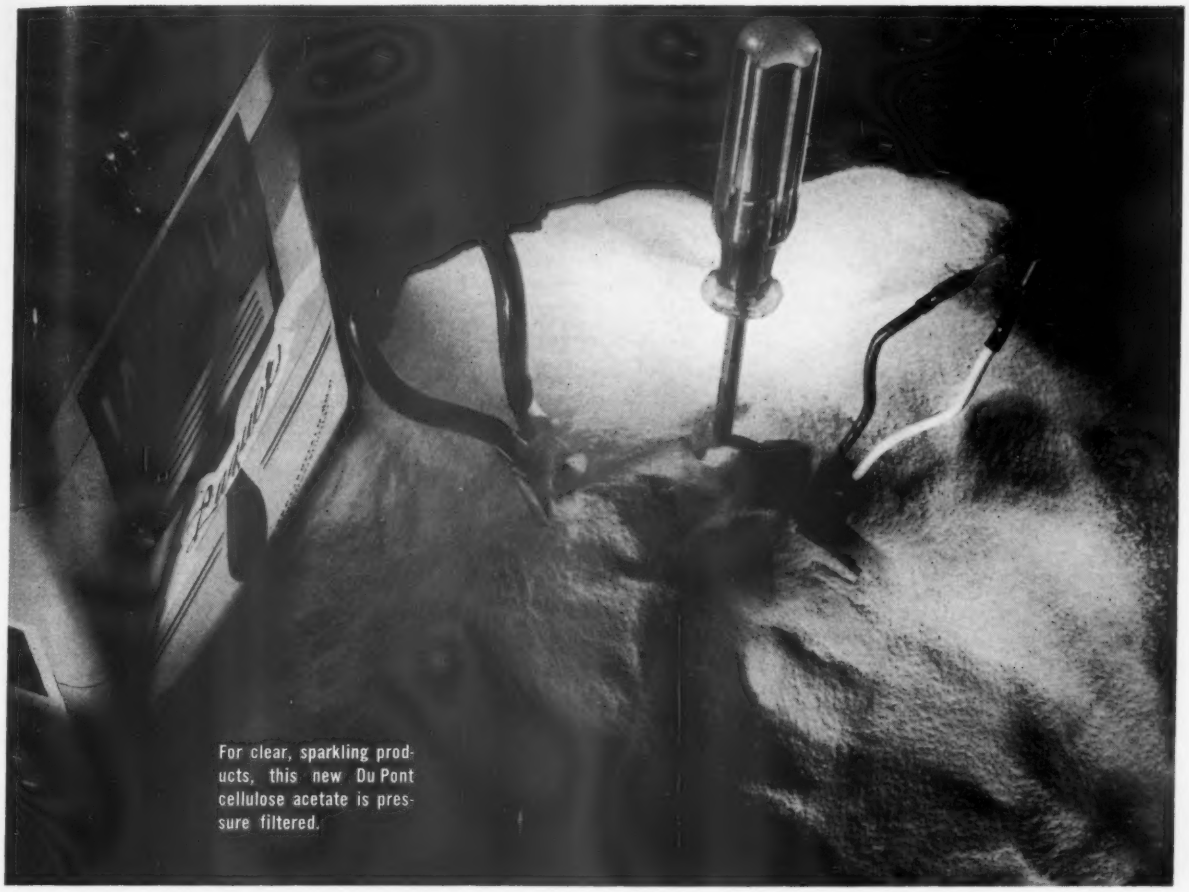

For clear, sparkling products, this new Du Pont cellulose acetate is pressure filtered.

Now from Du Pont

FLAKED CELLULOSE ACETATE

...for lacquers and molding powders

Here's a new Du Pont cellulose acetate. It leaves your formulations free from fibers and gel particles.

Excellent clarity and sparkle. If appearance is important to your product, you'll like the way this new Du Pont C/A adds the clarity and sparkle of fine crystal.

Other properties. Du Pont C/A is tough. It has excellent light-stability characteristics, low flammability, excellent electrical resistance, good solubility. It goes into clear, water-white solutions rapidly. It's free from acidity.

Wide range. You can get this flake over an acetylation range from 52% to 56%, in viscosities stretching from 3 to 150 sec, Du Pont 20% viscosity.

Available in 60-lb. multiwall bags.

For information on pricing and shipping arrangements, call or write Du Pont, Explosives Department, 6539 Nemours Building, Wilmington 98, Delaware, or contact any of the offices listed below.

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Better Things for Better Living . . . *through Chemistry*

TECHNICAL Bulletins

LAB APPARATUS

The 36th edition of *What's New for the Laboratory* has been announced.

Bound inside this 16-page issue is a 32-page catalog illustrating and describing the new "precision" line of Freas ovens.

In addition to publicizing the new "SGA" 1565-page General Catalog, *What's New* features a new structural system called "Versa-Loc" for building, mounting, supporting, holding and clamping; a new titration apparatus for rapidly detecting the end point in dark colored solutions; a heavy-duty stirrer with three shafts; Ainsworth recording balances; Bausch & Lomb 3-D stereo-microscopes; an electric mortar grinder; torsion dial balance; several August Sauter balances; various new corning items; polyethylene ware; and many other laboratory aids.

Scientific Glass Apparatus Co., Inc., Dept. PVP, Bloomfield, N. J.

PHOTOMETRIC UNIT

A new eight-page newsletter, Volume 6, Number 55, entitled *Gardner Automatic Photometric Unit and Improved Precision Exposure Heads* has been made available by Gardner Laboratory, Inc., Dept. PVP, P. O. Box 5728, Bethesda 14, Md.

Nineteen different types of precision exposure heads, which can be operated from the Gardner Automatic Photometric Unit, are described. Included is a table which lists the applicable specifications.

GENERATORS

A bulletin, describing the firm's new line of packaged inert atmosphere generators, has been published.

The bulletin includes typical installations, applications, features, and a comprehensive flow chart.

Also included is a utilities table showing at a glance the amounts of gas, power, and water required to obtain maximum capacities.

Gas Atmosphere, Inc., Dept. PVP, 20011 Lake Road, Cleveland 16, Ohio.

MULTICOLOR PAINT

Multicolor, the Paint of Tomorrow is the title of a new brochure now available.

Presenting a comprehensive picture of multicolor's performance advantages and fast-growing market potential, the brochure explains how any paint manufacture can now formulate the coatings with conventional paint-making equipment.

Reasons why multicolor paints should be included in marketing plans plus specific advantages of these coatings over conventional paints and finishes are presented in detail. Current and potential applications for multicolor as an economical finish or decoration are illustrated and described.

Marbon Chemical Division, Borg-Warner Corp., Dept. PVP, Box 68, Washington, W. Va.

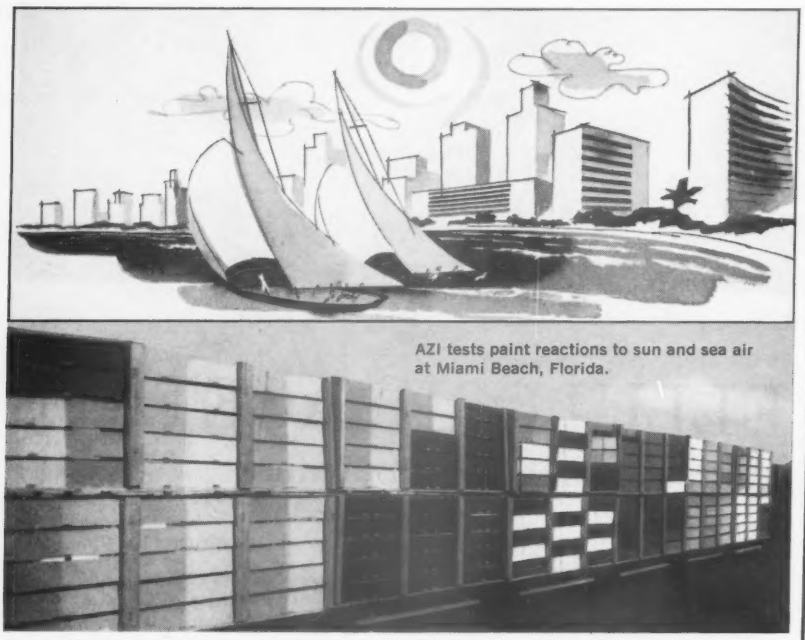
POLYCARBONATE

A bulletin, entitled *First Polycarbonate Applications*, has been made available.

Illustrated and discussed are the following: Transparency, heat resistance, dimensional stability, oxidation resistance, impact resistance, creep and recovery, wear properties, and processability.

Also included is a table outlining the properties of molded Lexan resin.

General Electric Co., Chemical



AZI tests paint reactions to sun and sea air at Miami Beach, Florida.

Are your paints required to withstand

SUN AND SEA AIR?

Research by AZI helps you improve paint formulations

Nationwide tests of paint reactions to *sun, sea, air, industrial and city smoke* will indicate best levels of zinc oxide for improved tint retention, durability, non-chalking action, and resistance to mildew.

Improvements like these in paint quality often insure increased saleability—and profits; yet added levels of ZnO provide this insurance for only a fractional part of the total cost of the paint.

For full details, write: American Zinc Institute, Inc., 60 East 42nd Street, New York, N. Y.

AMERICAN ZINC INSTITUTE, INC.

60 East 42nd Street, New York 17, N. Y.

and Metallurgical Division, Dept. PVP, One Plastics Ave., Pittsfield, Mass.

CAPROLACTAM

A revised and enlarged caprolactam technical bulletin has been prepared.

The physical and chemical properties of this versatile material are presented in addition to a discussion of the various reported uses including applications in plastics, coatings, adhesives, solvents, and organic synthetics.

Chemical reaction routes to commercial possibilities are explained and schematically diagramed.

Public Relations Dept., Allied Chemical Corp., National Aniline Division, Dept. PVP, 40 Rector Street, New York 6, N. Y.

COLOR MATCHING

R_x for Color Blind Light Sources is the title of a new brochure now being offered.

Using a cartoon technique, it discusses the problems facing industry in its efforts to provide proper illumination for color matching, color grading, and color shading.

The brochure also includes photos of typical installations already in use, and an accompanying "Engineering Survey Form" offers the technical assistance of a Macbeth engineering salesman, who is qualified to make recommendations as to type and placement of Macbeth color corrected lighting.

Macbeth Daylighting Corp., Dept. PVP, P. O. Box 950, Newburgh, N. Y.

FIRE RETARDANTS

A bulletin, entitled *F-X Fire Retardants*, has been made available.

A chart is included which indicates the low flame spread rate of F-X coatings.

Sections are devoted to fire protection, colors, target areas, and intumescence. Application and storage of the paint are discussed.

The St. Regis Corp., Dept. PVP, 4990 East Asbury, Denver 22, Colo.

APPARATUS LISTING

A 48-page *Apparatus Review* features the new line of Freas ovens, incubators, sterilizers, and special purpose cabinets in a 32-page section.

Electric mortar grinders, microtitrators, new model cone-drive stirrers, Beckman GC-2 gas chromatographs with new fraction collectors, gelation timers, direct projection reading scales, moisture determination balances, electrobalances, Reyers-Progress balances, Tempunits for water baths, water bath shakers, optical goniometers, melting point determination apparatus, and centrifugal chromatographs are described in this Review.

Also listed are Pumpett automatic pipetting devices, microliter syringes, sectioned disposable Petri dishes, wrap-around safety shields, set-up supports, electronic relays, hot plate-magnetic stirrers, multimantles, heat controllers, five-in-one controls, knife-type immersion heaters, crystal lattice models, atom models according to Stuart and Briegleb, vernier calipers, stopwatches, electric furnaces, ect.

Arthur S. LaPine and Company, Dept. PVP, 6001 South Knox Avenue, Chicago 29, Ill.

TALL OIL ETHOXYLATE

Technical Bulletin #659-1, describing a new 100% tall oil ethoxylate, marketed as Sole-Terge Toe, has been made available.

Properties and solubilities information are outlined and various formulating suggestions are included.

Sole Chemical Corp., Dept. PVP, 27 E. Monroe St., Chicago 5, Ill.

SAVE WITH

SUCO Duratone Red

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New Books

A Glossary of Pigments, Varnish and Lacquer Constituents

By J. H. Martin and W. M. Morgans. Published by the Chemical Publishing Co., Inc., 212 Fifth Avenue, New York, N. Y. 111 pages. Price $3.50.

This glossary consists of two sections. Section one is devoted to pigments. Section two is devoted to the varnish and lacquer industries.

It gives detailed descriptions of the raw materials, processing steps, and intermediate and finished products that occur in these industries, including the most recent terminology.

For easy reference all items are arranged in alphabetical order and ample cross references are included.

The book will be of assistance not only to manufacturers, chemists, technologists, purchasing agents, and salesmen of these industries, but also to beginners and students who plan to make varnish- and lacquer-making their career.

Kunststoff-, Lack- und Gummi-Analyse: Chemische und Spektroskopische Methoden

By D. Hummel. Munchen, Karl Hanser Verlag, 1958. Two Volumes (409 & 183 pages). Prince $39.00.

Infrared spectroscopy, supported by analytical chemistry, is presented as the preferred physico chemical method for qualitative analysis of lacquer resins, plastics and rubber. Vol. I ("Textband") discusses infrared techniques in chapters dealing with chemical group reactions pertinent to the subject; physical methods for identification of raw material macromolecules such as those of natural resins, lacquer oils, modified resins, etc.; properties and identification of additives (plasticizers, stabilizers, vulcanizing agents). The final chapter offers selected examples of technical analysis. The second volume ("Tafelband") is a catalog 549 photographically reproduced spectra of "all industrially important oils, resins, polymers and additives". Both volumes are excellently finished, on gloss paper and well bound.—The author is with R. Bosch GmbH, Stuttgart (Germany).

1958 ASTM Proceedings

Published by the American Society for Testing Materials, Dept. PVP, 1916 Race St., Philadelphia 3, Pa. Price $12.

The American Society for Testing Materials announces the publication of its *1958 ASTM Proceedings*, Volume 58. The 1430-page volume, recording the technical accomplishments of the year, includes reports and papers together with discussion offered to the society during the year and accepted for *Proceedings*. The volume includes the Summary of Proceedings of the ASTM 61st Annual Meeting, listing by title and author the programs for each session.

The annual report of the Board of Directors highlights matters administrative, technical, and financial for the benefit of members. Included are records of all meetings held by the Society and its districts, information on membership gains, publications, honors and awards, and other matters of interest. There are 74 reports of technical committees which together with appendices provide a wealth of useful information as do the 51 technical papers and discussions on a wide variety of subjects pertaining to research and testing materials.

In addition to the papers and reports embodied in the *Proceedings*, there are listed all symposia and other special sessions published separately as Special Technical Publications, and all papers published in the ASTM Bulletin.

Although the Society's publications program has expanded greatly in recent years with an ever-increasing number of Special Technical Publications, and a Book of Standards now requiring 10 parts for its 14,300 pages, the *Proceedings* remains the repository of factual information and a record of the Society's work.

It should be emphasized that in addition to the reports and technical papers many of which have been given at the national meetings and some of which have been preprinted, the *Proceedings* contain much discussion not previously published.

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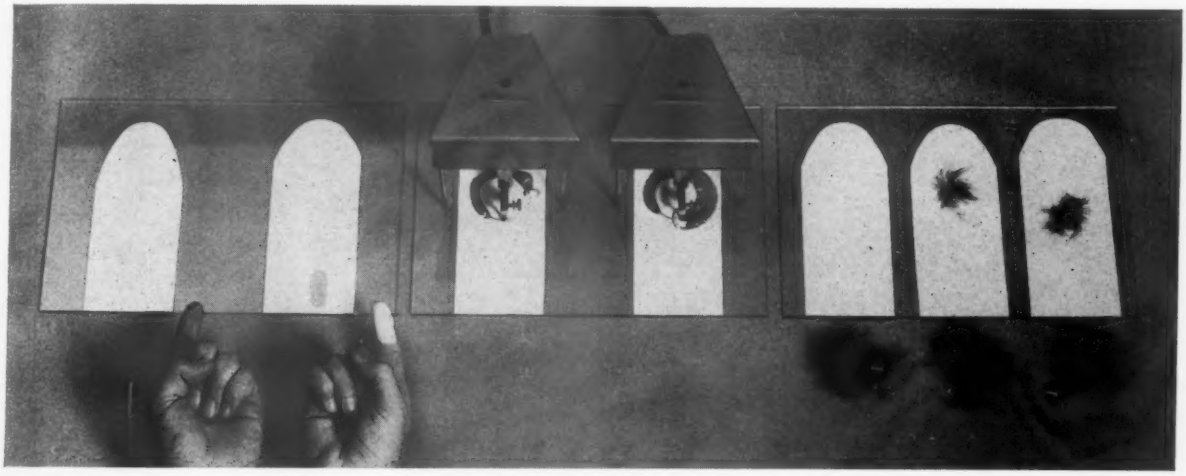

FINGER TEST... Left Drawdown – Safflower – IPA base . . . Right Drawdown – Tall F. A. – IPA base

DRY TIME RECORD – 24 hour cycle . . . Left Drawdown – Safflower – IPA base . . . Right Drawdown – Linseed – IPA base

COTTON PUFF TEST... Left Drawdown – Safflower–IPA base... Center Drawdown–Tall–F.A. –IPA base... Right Drawdown–Linseed–IPA base

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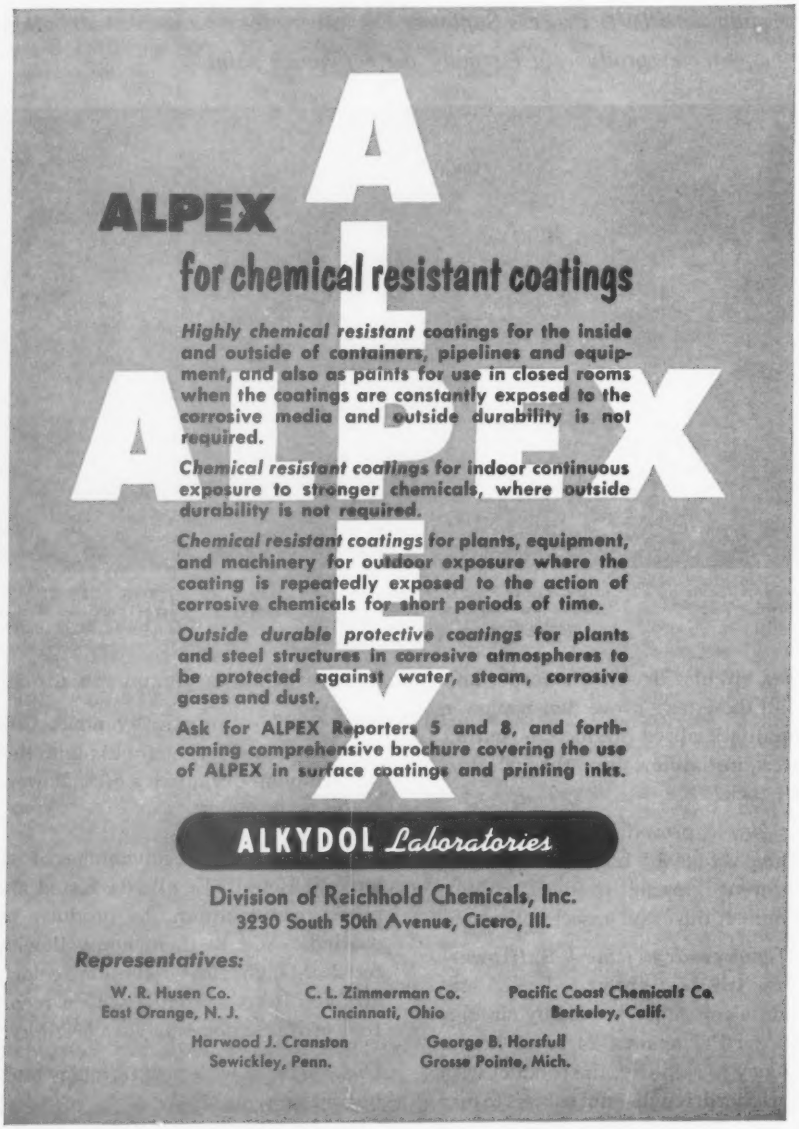
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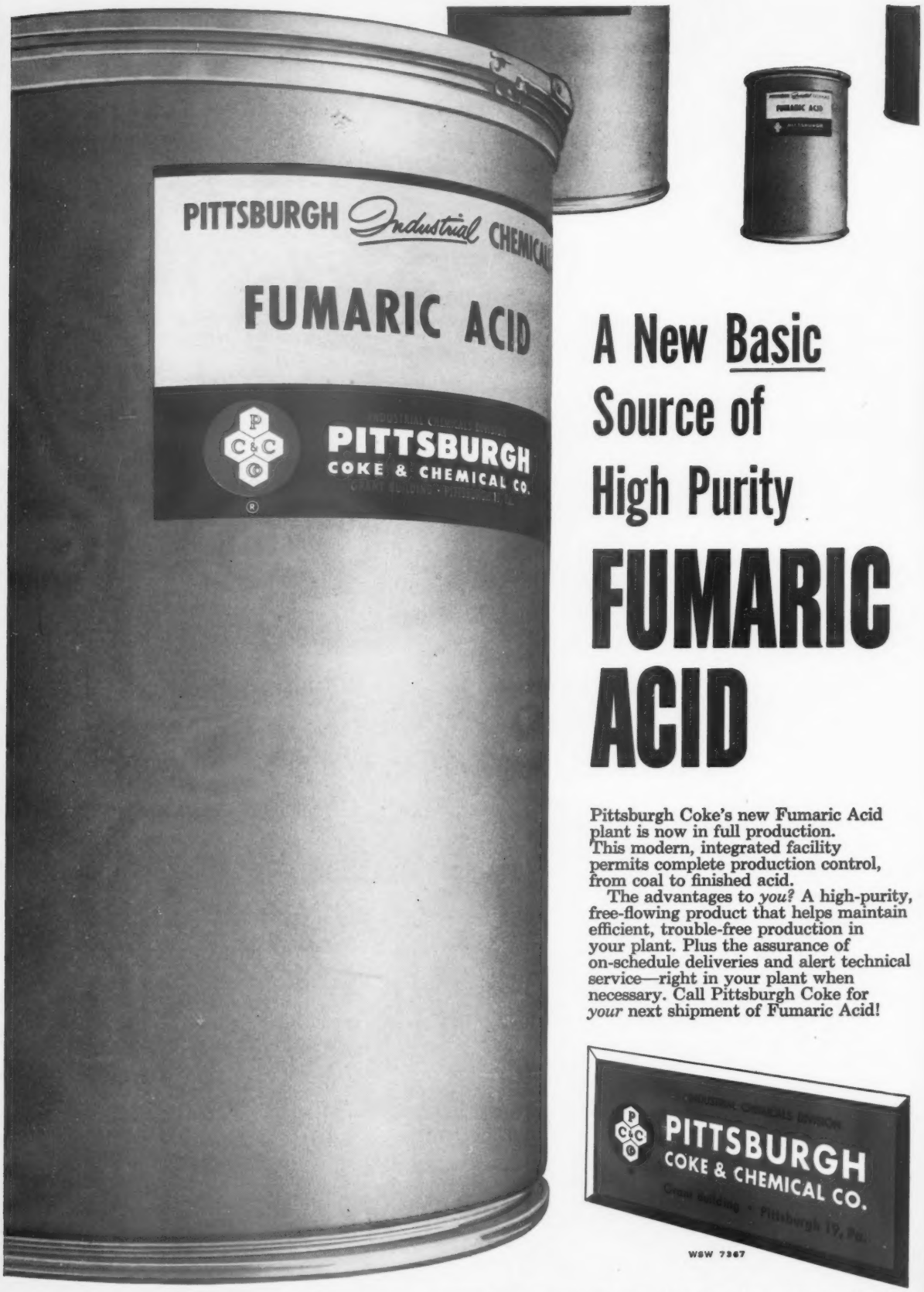
foreign developments

Paint Chemist Visits Moscow

Soviet, Polish and Czech Abstracts

The key to paint progress in the Soviet Union lies in the availability of basic chemical raw materials. Here is the coke and chemical plant located in Zapovozhie, Ukraine, from which many basic paint raw materials are obtained. Turn to page 97 for an on-the-spot report of the paint industry in Russia as seen by a paint chemist.



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A PAINT CHEMIST VISITS MOSCOW

Dr. Walter B. Maass, consulting chemist, finds keen interest in product finishes and finishing methods to meet requirements of present Soviet industrial effort.

"Ah, the wonderful colors!" said the little woman with the babushka "Please tell me, comrade, where can I buy your paints?"

These words were spoken at the Austrian Industrial Exhibition which took place in Moscow recently.

Five Austrian paint companies participated.

The interest was simply staggering. Almost half a million Russians came to see the show. The booths of the five paint manufacturers were constantly surrounded by tremendous crowds. A surprisingly large number of specialists—many of them chemists and engineers—turned up and the exhibitors and their Russian interpretors were faced with a barrage of questions regarding their products.

This enormous interest of the Russian people was somehow exhilarating. Standing at my booth, with Raissa Ivanovna, my valiant little interpretor at my side, I had the feeling that the whole Soviet Union was marching by to ask me questions about almost anything from latex paints to hammer-tone finishes. And this was not merely an illusion. During these two weeks I talked to people from all parts of that enormous country. There was a journalist from Estonia, an engineer from Ulan Bator in the Mongolian People's Republic, a lady chemist from Vladivostok, technicians from the big motorcar factory at Gorkij a.s.o.

Of particular interest was a round table discussion between the representatives of the Austrian paint companies and eleven Soviet technicians, most of them from larger consumer industries. Their questions centered around automotive finishes, insulating varnishes and various industrial specialty coatings. The Soviet Union has a large paint industry which is spread all over the country. Nevertheless, certain paints and lacquers are imported from Austria, Czechoslovakia and East Germany. Import of these products is limited to industrial finishes. Trade sales paints are of secondary interest to the Soviet Government and the woman, who wanted to buy Austrian paint for refinishing her furniture will be disappointed. Russia's first aim is industrialization. Let nobody underestimate this gigantic effort of a country which is three times the size of the United States and is inhabited by 209 million people.

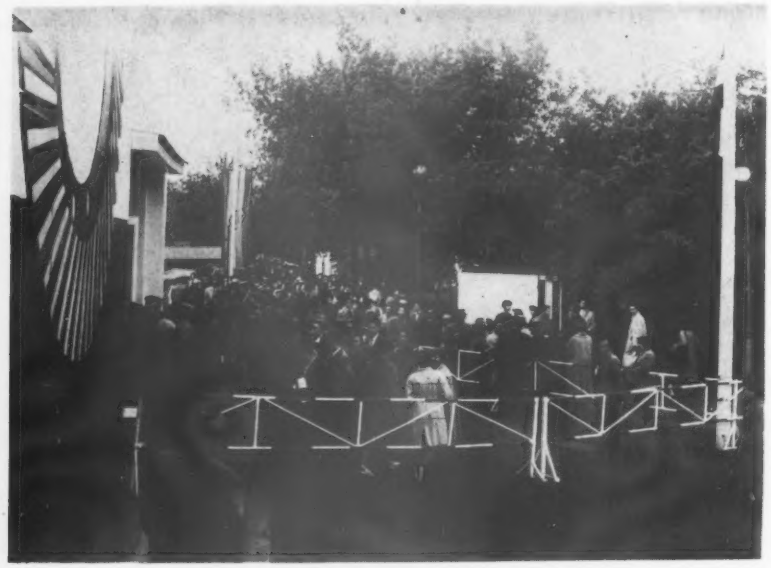
That is not to say that the needs of a growing population are being forgotten. One has only to drive from Vnukovo Airport to the center of Moscow to be faced with whole new areas of large apartment buildings. They don't look very different from our own "Gopherville" type buildings. Naturally a lot of paint is being used on these large housing projects.

Thus far, Russian architectural and maintenance paints are mainly of the oleoresinous and alkyd type. But sooner or later a change can be anticipated. The Government has recently called for a program for conserving vegetable oils for other industries. This means more re-research and demand for "non-oil" paints. Therefore, a strong trend towards latex paints and other coatings with little or no content of alkyd resins is to be expected. There can be no doubt that paint consumption in the Soviet Union is on the rise. Moscow is one of the cleanest cities of the world—a whole army of old women, armed with rags and brooms is laboring day and night to keep it in shape. An administration, so conscious of

"clean up" will be forced to do something for "paint up" too.

One of the most interesting high lights of my trip to Moscow was a visit to the large Lichatchow factory. This plant manufacturers 450 trucks per day, also makes busses, bicycles, refrigerators and a small number of large cars, the ZIL (something between a Rolls Royce and Buick, mainly used by Soviet VIP'S).

Lichatchow employs 42,000 workers. About 30% are women and they do all the spray work. The manager of the bus painting division was a woman too, and she seemed to be a most capable executive. Under her guidance I could follow the whole finishing process. First, the parts were sprayed with a brown rust-inhibitive primer (I had no opportunity to ascertain if it contained zinc chromate!). Then the parts were baked, assembled, spray-painted again with a light grey ground coat. After some spot-sanding a baking enamel was applied and the busses were driven into large ovens. Baking took place for 20 minutes at 100-120°C.



Russian crowds lining up at exhibit entrance.

The appearance of the finished busses was not up to our standard, especially a pronounced orange peel was noticable, but hardness and gloss were fair. The chassis was finished separately with asphalt varnish by a sort of simplified flow coating process.

There were several interesting aspects to the factory tour. Assemblying was done by conveyor and the men on the production line worked hard and fast to keep things going. Speed of production is being stressed and deserving workers have their photos exhibited on a board plus receiving a special bonus.

Posters with Communist slogans were displayed all over the plant. Like in all Soviet offices, pictures of Lenin and quotations from his speeches are everywhere. A rather amusing incident happened during the tour of a Lichatchow plant. The interpretor in charge was unable to translate many technical terms from Russian into German, which was embarrassing. None of the Russians spoke any English either. However, one of them spoke perfect Spanish and it turned out that an Austrian visitor understood this language very well. So we adapted the following procedure: first the plant manager explained everything in Russian, her aid repeated in Spanish and the Spanish speaking Austrian translated his words into German for the benefit of all other guests. A rather complicated set-up, but it worked.

Another interesting experience was a visit to the Lenin library, the largest in Russia and almost as big as our own Congressional Library in Washington D. C. It was founded under Czar Alexander II but greatly enlarged in recent years. They seem to have everything from early Russian prints to "Paint and Varnish Production" (I made especially sure that they really had PVP). The librarian who guided me around was one of the few Russians I met, who was relatively well versed in American literature. She had read Dreiser, Hemingway and Howard Fast. The library owns all books—Communist or not—but a special authorization is required for studying those which are considered subversive.

No description of Moscow could be complete without a word about the new Lomonosow University. This is an achievement of which the Soviet Government is rightly proud. The new buildings—the old ones on Mokhovaja Street date back to the nineteenth century—are on the slopes of Lenin Hills and you get a breathtaking view of the city from a balcony of the 32 stories edifice. The chemical department occupies a separate building. The University has presently 24,000 students, a large number of which lives on the premises in the residential section. About 30% of them are foreigners, many of them from China and other Asiatic countries. An interesting characteristic is the large percentage of girls studying sciences. I talked to a few chemistry students and they claimed that 60% in their class were women. Undoubtedly there is a large number of women working in paint and allied laboratories. For a visitor from a country where the female paint chemist is still a rarity, this is somewhat amazing.

Will Russia catch up with the US economically? The question is not an easy one to answer and only a very long sojourn in various parts of the Soviet Union can enable a visitor to speak with real authority. It is difficult to judge a country which produces Sputniks but where even a first class hotel has no egg-timer. We are still well ahead in consumer goods but I wouldn't be surprised if Russia catches up with us in 10-15 years and becomes our major competitor in the world market.

Unfortunately, it did not prove possible to visit Moscow's only large paint plant which employs 900 workers. But through many discussions with Russian paint men one can deduct many facts

about raw materials and paint application. Production is always considered the main factor; therefore, devices and methods which cut down on waste are of major importance. There was for instance a great deal of discussion on electrostatic spraying and flow coating. This is a country of mass production, appearance and beauty are secondary considerations. Pretty effects like metallics and hammertone finishes will raise eyebrows but will probably not be used on a large scale, at least not at the present time.

The Soviet Union has plenty of raw materials and produces pigments and synthetic resins on a large scale. Many areas which were considered as backward are getting more industrialized and technical manpower is systematically being developed. This seems to be particularly true of the smaller Soviet Republics of Southern Russia: Georgia, Armenia, Aserbaidchan and Uzbekistan.

Will the Soviet Union become a large exporter of raw materials for the paint industry in the near future?

This is not very likely. They will need these raw materials for their domestic production. Gum rosin, xylol and a few other solvents are being exported now on a limited scale. Industrialization and city building is progressing at such a pace that most domestic raw materials are absorbed within the Soviet Union.

Evaluating all these facts we arrive at the following conclusions:

1) The Soviet Union will expand both its production of organic finishes and of raw materials, used for this industry.
2) Preference will be given to industrial finishes and perhaps on a smaller scale to maintenance paints for vital industries.
3) Research and development on synthetic resins and emulsion paints is progressing.
4) Technical and scientific manpower is well skilled and great attention is being paid to develop it in all parts of the country.
5) The free world might profit by exchanging technical information with the Soviet Union within the limits of economics and strategic interest.

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SOVIET, POLISH and CZECH ABSTRACTS

Brush-Roller With Pneumatic Paint Input

By M. Bilianskii, "Morskoi Flot," Vol. 19, 35-36, February 1959.

Rejecting manual paint application with brush as being too slow, and spraying as being unhealthy, the author describes a brush roller, successfully tested for application of ethinol paints on ship surfaces. The paint is injected on the roller, or inside the roller, under pressure (pneumatically). Schematic diagrams.

Preparation of Aluminum Resins

By V. Kugler, "Chemicky Prumysl," Vol. 9(34), 2:97-101, February 1959.

A study of the synthesis of aluminum resins prepared by hydrolysis of the reaction intermediate of 1 mol aluminum ethanolate and 1 mol ethyl acetoacetate at elevated temperatures. The reaction mechanism, leading to polymeric compounds, may be anticipated from the amounts of liberated ethyl alcohol, of aceto-acetate, and of water consumer in hydrolysis. It was found that ethoxy groups prefer to react with water, while acetoacetic groups remain unchanged up to temperatures of monomer decomposition (180-190°C.) The course of polymerization reactions as as well as the character of the products formed are influenced by the ratio of the aluminum content in the molecule of the intermediate products to the amount of water used for hydrolysis. The polymer formed is a mixture of molecular chains of different magnitude, which can even possess a three-dimensional configuration (aluminum and oxygen constituting the skeleton of the chain). From the results obtained, no unambiguous conclusion can be made as to the chemical and physical structure of aluminum resins.

Protective Action of Dicyclohexylammonium Nitrite

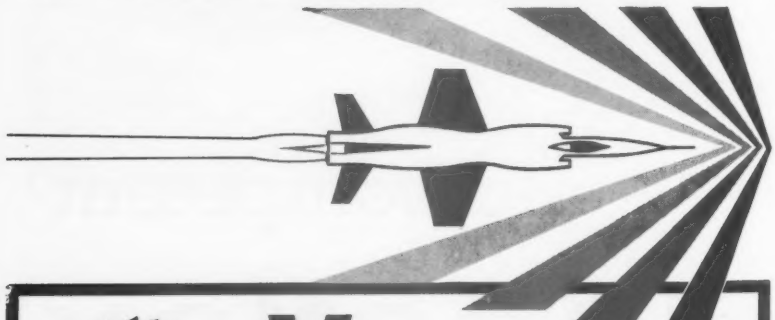
By S. A. Gincberg, "Zhur. Priklad. Khim.," Vol. 32, 2:459-461, February 1959.

A study of the electrochemical behavior of steel (C content: 1.2%) in various solutions of dicyclohexylammonium nitrite, using water as electrolyte, by measuring the potentials and determining the character of polarization. The results indicate that the protective action of dicyclohexylammonium nitrite is caused by the nitrite ion; the dicyclohexylamine exerts no influence on the anodic process. Similarly, it is concluded that the protective action of the inhibitor against atmospheric corrosion is also conditioned by the presence of the nitrite ion, whereas the dicyclohexylamine donates a cation which forms (with the nitrite) a volatile compound evaporating already at room temperature. It is suggested that the dicyclohexylamine may be substituted by another cation capable of forming a nitrite with sufficient vapor tension.

Preparing Lacquer For Coating Tin Plates

By W. Szymanski, A. Grosmam, L. Inforowicz, J. Nowak, Z. Pajdowski, & Z. Trzeciakowski, (Bydgoska Fabryka Opakowan Blaszanych Przedsiebiorstwo Panstwowe Wyodrebniowe), Polish Patent No. 38376, January 30, 1956, "Ref. Zhur. Khim.," 4:13827P, 1959.

A tung-oil modified condensation (in alk. medium) product of a mixture of phenols with formaldehyde is esterified with butanol, and diluted in organic solvents. EXAMPLE: 11 kg technical cresol (containing 29-30% *m*-cresol), 11 kg phenol, 22 kg 40% formaldehyde solution, and 3 kg ammonia (25%) are combined in an enamelled iron (or stainless steel) vessel, steam-heated from the outside to violent boiling, then allowed to react for another 20 min. before cooling and adding water (25% of vessel contents). After the water layer was separated, the resin viscosity = 150-200 sec (on Ford funnel No. 4, at 20°C), and it contained 15% free phenol. Butyl alcohol (22 kg) was added, and the mixture heated with distilling condenser until the condensate became transparent (this required that some 50% of the butanol was driven off); the temperature in the vessel read 125-130° C. The resin was then combined with 8 kg tung oil and heated, using dist. condenser and stirrer, under normal pressure. At 140°C, the condenser was replaced with a reflux condenser, and heating proceeded at the same steam pressure and with frequent stirring for another hour, followed by addition of 5



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kg pure white spirit. At 110°C, 10 kg xylene and 8 kg toluene were added, the mixture stirred and cooled to 20°C, followed by addition of solvent to a viscosity of 35-40 sec. Finally, the lacquer was passed through a Cu-screen (10,000 pores per 1 cm^2).

Properties of Carboxymethylcellulose

By G. A. Petropavlovskii, "Zhur. Priklad. Khim.," Vol. 32, 2:241-253, February 1959.

An account of the mechanical properties of carboxymethylcellulose films, and of the following characteristics of sodium carboxymethylcellulose: viscosity, molecular weight determination by osmotic method, determination of the degree of polymerization and of substitution, the dielectric properties, surface-active properties, and adsorption. Some remarks on the biological resistance of Na-carboxymethylcellulose. 27 literature references.

Preparing Lacquer From Rosin

By M. Niszczinski, Polish Patent No. 38960, February 20, 1956, "Ref. Zhur. Khim.," 4:13829P, 1959.

Rosin, heated to 180°C, is subjected to passage of water vapor for one hour; after addition of about 4% ZnO (or CoO), the rosin is again heated at 180°C until it becomes transparent. Upon cooling to 150°C, 10-15% of polymerized fish or drying oil is added, and the mixture is kept at same temperature for another 30 minutes. At 95° C, the following are added: 10-15% turpentine, and water (heated to 90°C and with stirring), and emulsifier. Example of lacquer composition (in parts of weight): treated rosin 30, water 60, turpentine 5, rosin soap 0.2. The lacquer forms hard and elastic films.

Fillers for Carbamide Resins & Protein Glues

By R. Z. Temkina, G. P. Plotnikova, & R. A. Mirkovich, Gos. nauchno-tech. komitet Soveta Ministrov RSFSR, 1958.

A supplement to the November 1958 issue of *Derevoobrabatyvaiushchaia Promyshlennost'* on the technology of manufacture and the uses of carbamide resins and protein glues with consistent fillers. A variety of fillers (protein food yeasts, ligneous flour, lignin etc.) are discussed. The use of carbamide resins and proteinaceous glues permits a 10-15% reduction in the cost of starting materials; the publication encourages wider use of these materials.

New Instrument For Micromechanical Investigation

By V. R. Regel', G. V. Berezhkova, & G. A. Dubov, "Zavodskaia Laboratoriia," Vol. 25, 1:101-105, January 1959.

A description of the design and operational characteristics of a new instrument is claimed to record expansion and contraction curves, tension relaxation curves, and (in presence of a deformation measuring device) creep curve. The instrument employs a photo-electro-optical dynamometer for power measuring, making use of the photo-elasticity and photo-effect phenomena. The paper reports on the investigation of mechanical properties of plastics (with an elasticity modulus not exceeding 1000 kg/mm^2) and high-molecular substances, carried out with the help of the instrument. The device was exhibited in 1958 at Brussels World Fair.

Use of Corrosion Inhibitors

By M. Karelina & B. Sushkov, "Morskoi Flot," Vol. 18, 12:15-16, December 1958.

An informal report on the work on corrosion inhibitors carried out in several USSR institutes in 1957-1958. Tabulated results show the effectiveness of an ammonia-benzoic acid composition ("AMBA") in gasoline etc. solutions for the protection of metallic surfaces.

Phenylhydroxylamine Derivatives

By A. Iu. Baskakov & N. N. Mel'nikov, "Khimicheskaia Nauka i Promyshlennost'," Vol. 3, 7:683-684, November 1958.

A report on the preparation and activity of new compounds with herbicidal properties. Oxy derivatives of isopropylphenylcarbamate, with hydroxyl in the ortho, meta and para positions, were prepared by reacting equimolecular quantities of aminophenol or phenylhydroxylamine and isopropyl-chlorocarbonate.

New Mode of Polyolefin Synthesis

By V. P. Parini & A. A. Berlin, "Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk," 12:1499, 1958.

A letter to the editor reporting on a new possibility to synthesize linear polyolefins and their derivatives. Benzidinedicarbonic-3,3' acid, when bisdiazotized and upon subsequent decomposition of the bisdiazo compound, forms a soluble polymer. The polyacid forms a hard film. The conversion may also be effected by using di-(N-nitroso-N-acetyl)diamines in an analogous manner.

Seminar on Ethinol Paints

"Morskoi Flot," Vol. 18, 11:31, November 1958.

Ethinol paints have been used since 1956 in the USSR shipping industry on account of their considerable water resistance, short drying time (2-8 hours at 20°C), possibility of application in temperatures to −25°C, and high adhesive powers on steel surfaces. The "Slava-6" coating offered full protection 10.5 months after application, in both tropical and antarctic conditions. The ethinol paints are 1.5-2 times cheaper to use than oil paints. The seminar took place in Riga.

Element-Organic Polymer Compounds

By K. A. Andrianov, "Uspekhi Khimii," Vol. 27, 11:1257-1303, November 1958.

A comprehensive summary account of the subject, with 320 literature references and arranged into the following chapters: polyorganosiloxanes, organosiloxanocarbonic polymers, polyalkylsiloxanamides, polyalkylthianates, polyorganometallosiloxanes.

Alkyldichlorosilanes Reaction With Chlorohydrocarbons

By S. N. Borisov, M. G. Voronkov, & B. N. Dolgov, "Zhurnal Obshchei Khimii," Vol. 28, 12:3292-3297, 1958.

A study of the reactions of ethyldich-

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lorosilane with n-propyl, isopropyl, and allyl chlorides. In the presence of aluminum chloride, ethyldichlorosilane undergoes conversion to ethytrichlorosilane by reducing aliphatic chlorohydrocarbons to appropriate hydrocarbons.

Temperature Dependence of Drying Oils Viscosity

By B. N. Shakhel'dian, "Masloboino-Zhirovaia Promyshlennost'," Vol. 25, 3:38-40, March 1959.

Using a capillary viscosimeter, the author studied the relationship of drying oil viscosity and temperature in the temperature range 20-80°C, using drying oil prepared by polymerizing four samples of linseed oil to different degree of polymerization. The dependence of drying oil viscosity upon temperature is given by the exponential function

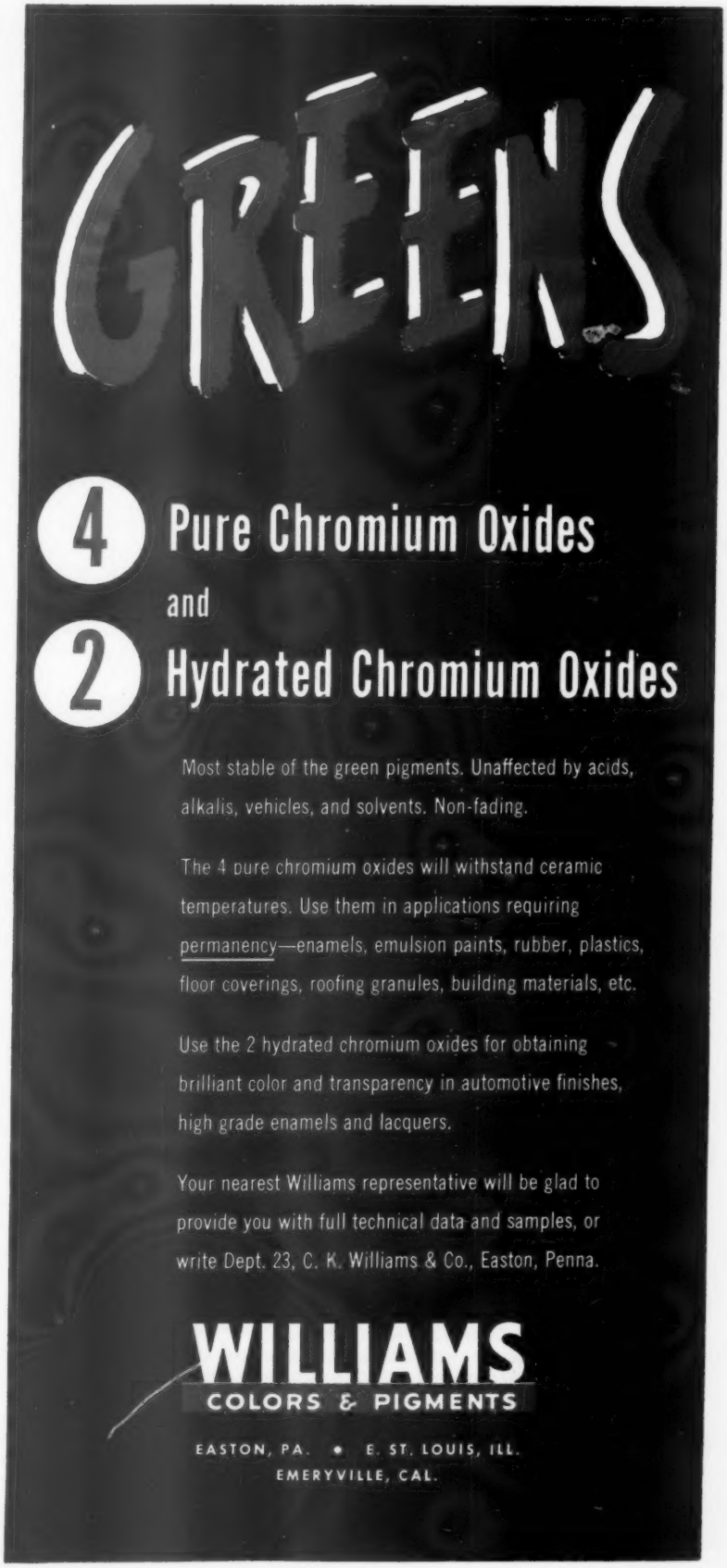
$$\eta = A\,l^{\frac{W}{kT}}$$

established earlier by Lazarev and Rashchektaeva (*Tekhnicheskaia Fizika*, 1935, No. 5). The temperature coefficient W, necessary for viscosity conversion, varies with the degree of polymerization of individual oils, and assumes a larger value with increasing viscosity of the oil. The article reproduces a nomogram permitting to calculate the approximate viscosity of drying oils at definite temperatures without experimental determinations. Experimental results have shown the nomogram values to be accurate enough for practical use.

Determining Properties of Yellow Ferric Oxides

By M. Kranz & A. Witk wska, "Przemysl Chemiczny," Vol. 38, 2:88-91, February 1959.

In connection with previous experiments on the influence of trace directing substances on the color and properties of yellow ferric oxides [Krause, A., *Przemysl Chemiczny*, vol. 37, 580 (1958)], the authors examined the effect of anions connected with the highly active Cd^{++} cation, and with the (in this situation) inactive ions of alkaline metals (Na and K). This method permits to eliminate the action of cations and to study the behavior of the sulphate, acetate, chloride, bromide and iodide anions. It was established that besides the action of the trace substances, the anions also exert selective influence on the properties of yellow ferric oxides. The directing effect is in fact due to the joint action of the cation and its appropriate anion. In general, the directing action of anions alone is less energetic and sometimes less advantageous than that of anions plus the cadmium ion.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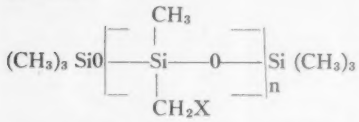
Properties of Liquid Polydimethylsiloxanes

By A. K. Andrianov & L. I. Makarova, "Izvestiia Akademii Nauk SSR, Otdelenie Khimicheskikh Nauk," 1959, 3:450-459, March 1959.

The authors synthesized new linear silicon-containing polymers of various degree of polymerization, having the structure



where X is $-OCH_3$, $-OC_2H_5$, or $-OCOCH_3$. Liquid polydimethylsiloxanes, containing simple ether groups in the methyl radicals, were prepared by cohydrolyzing trimethylacetoxysilane with methylalkoxymethyldiethoxysilane; the reaction proceeded by hydrolysis of the acetate and ethoxide groups bonded to silicon. Polymers, containing acetoxymethyl groups in the side methyl radicals and having trimethylsilyl end groups, were prepared by cohydrolysis of trimethylacetoxysilane with acetoxymethylmethyldiacetoxysilane; the Si-C bond is not distrubed in this case, either. The properties of these polymers were determined and tabulated. The dependence of the viscosity of these compounds upon temperature is pronounced with compounds having acetate groups in the methyl radical. It increases with the increasing chain length of the molecule. The viscosity-temperature relationship was studied in temperature interval of -20° to 100°C. The activation energy of viscous flow was determined for the 0°-100°C temperature range; it was found to depend on the nature of the polar groups entering the molecule.

Birch-Bark Resin—Substitute for Shellac

By R. I. Kharchenko & E. K. Tsaregradskii, "Derevoobrabatyvaiushchaia Promyshlennost'," Vol. 8, 3:22, March 1959.

The preparation of birch-bark resin having a 91-95% solubility is reported; the resin was successfully used in varnishes. The "generally best" varnish preparation consists of 8-12% solution of birch-bark resin in a mixture of ethyl alcohol and turpentine oil (6:1); its application is similar to that of shellac. The mixing and polishing temperature should not exceed 18-20°C; if the mixing temperature is between 14 and 16°C, the resin concentration should be decreased to 6-7%. The resulting film is even, hard, and has a high gloss. For a weather-resistant coating, three coats are necessary, to be applied in intervals of not less than three hours. The film is lighted in color than shellac, but has a yellow-green tint. Colorless resin is obtained by dissolving the product in a 2% solution of caustic soda, bleaching it in a water extract of calcium hypochlorite, precipitating it in 10% HCl, washing, and drying at 50°C. The resulting varnish film is colorless.

Fast Polymerization of Caprolactam

By A. S. Shpital'nyi, M. A. Shpital'nyi, & N. S. Iablochnik, "Zhurnal Prikladnoi Khimii," Vol. 32, 3:617-624, March 1959.

The authors established that the reaction of caprolactam with excess of NaOH at 280°C leads to the formation of alkaline salt of aminocaproic acid, not to a sodium salt of lactam. The reaction scheme is proposed. Making use of the Porai-Koshits amidation reaction, it is held that there are no principal differences in the mechanisms of caprolactam, diamines, and dicarbonic acids conversion to polyamide polymers. Since the amount of added alkali was found to regulate the size of polymer macromolecules, the gradual character of alkaline polymerization is considered confirmed.

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(*From page 29*)

dimethylol urea insolubilizer was largely responsible for this effect. Reduction of the amount of dimethylol urea reduced the shrinkage but increased the water sensitivity. Coating 11 represents a compromise in the amount of dimethylol urea present. Although this coating does not shrink to any apparent extent, it does tend to soften and swell slightly the first few times it is wet. However, the softening effect disappears after about one month of weathering. Wet and dry cycles hasten the final insolubilization of this coating.

Dimethylol urea obtained from various sources differed in ability to produce insolubilization of polyvinyl alcohol coatings. The melting point and formaldehyde content of the dimethylol urea also varied. However, those samples that proved to be the better insolubilizers were found to have lower melting points that were very close to the value given in the literature. The variation in the behavior of dimethylol urea from different sources may have been due to the fact that this chemical, when improperly made or stored, forms a dimer known as Goldschmidt's compound. The presence of this dimer could cause the high melting points of the dimethylol urea which proved unsatisfactory.

A liquid aldehyde offers the advantages of easy mixing, volatility, and high purity which are not found in dimethylol urea. For these reasons, liquid aldehydes were investigated as insolubilizers for polyvinyl alcohol. An aldehyde was sought that would (1)

react easily with polyvinyl alcohol; (2) be water soluble or easily dispersed in water; (3) be sufficiently volatile to evaporate gradually after insolubilization had taken place. After a number of aldehydes had been tested, 2-ethyl butyral, n-hexanal, and 2-ethyl hexanal were found to meet these requirements, with 2-ethyl butyral the most promising. Using these compounds, formulations were produced that yielded coatings free of undersirable shrinkage and with high water and solvent resistance. It was not possible in this investigation to evaluate these compounds completely, but there was evidence that a formulation of this type might be more satisfactory than one containing dimethylol urea.

Insolubilizers were effective only when catalyzed by an acid salt or enough acid to produce a pH of 4 to 5 in the final coating. Numerous acid salts were tested and found satisfactory. However, acids were too corrosive. Ammonium chloride was generally used and was quite effective.

Isopropyl alcohol and isoamyl alcohol were added to improve application characteristics. The first coatings tended to form small bubbles which, on drying, left pinholes or weak points in the coating. The use of a small amount of isoamyl alcohol lowered the surface tension so that the bubbles broke quickly. The isopropyl alcohol also decreased drying time and improved flow characteristics.

In the aluminum-pigmented coatings, the particles of aluminum pigment tended to become charged when the coating was applied. The aluminum flakes arranged themselves in discrete groups, giving the coating a "freckled" appearance on drying. It was found that sodium carboxymethyl cellulose, in amounts less than 1%, completely eliminated the grouping tendency.

Physical data concerning use and application properties were obtained for coating 11. This coating was found to compare favorably with commercial coatings. In general, it is resilient and tough. Its flexibility is exceptionally good: it will crease without cracking at -40° C. It has a tensile strength (3) of about 850 pounds per square inch and an elongation of 30 percent. Its weight per gallon is 8.2 pounds. The hiding power of this coating (4) is 265 ft^2/gallon, which compares well with most paints, especially when the cost of the coating is considered. The Taber abrasion resistance, 0.0068 g/100 revolutions of the sample, was considered good in comparison with other materials tested in the same manner. Linoleum, for example, had a value of 0.0095 g/100 revolutions.

Weather-resistant polyvinyl alcohol coatings having high resistance to toxic organic solvents were prepared. These coatings depend upon the development of acetals to provide the necessary water resistance when applied. The coatings are well suited to application by conventional painting techniques. In physical and application properties they compare favorably with commercial paint coatings.

REFERENCES

1. Norbert Platzer, Polyvinyl Alcohol, Modern Plastics, **28**, 95-98, 161-166 (1951).
2. E. F. Izard, Forming Films, Threads, and the Like from Polyvinyl Alcohol, U. S. Pat. 2,169,250.
3. Federal Specification L-P-406, Plastics, Organic: General Specifications, Test Methods.
4. Federal Specification TT-P-141, Paint, Varnish, Lacquer, and Related Materials, Methods of Inspection, Sampling, and Testing.

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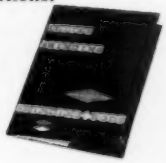

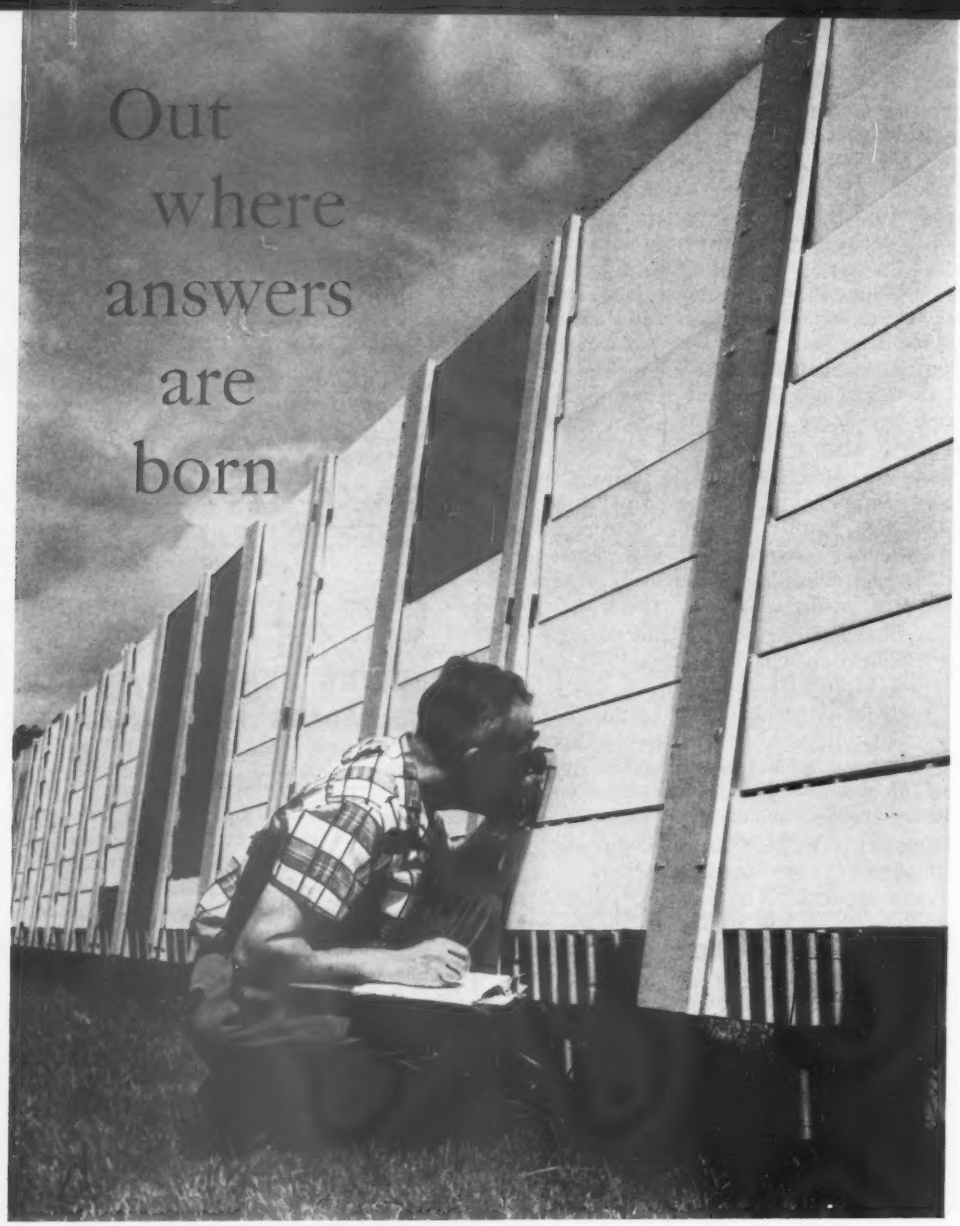

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NEWS

NEWS OF COMPANIES, ASSOCIATIONS
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ITEMS OF GENERAL INTEREST

Banner Year Forecast For Push Button Paint

Aerosol paint sales, propelled by the do-it-yourself trend, are expected by industry officials to rocket to even greater heights in the near future.

Aerosol industry surveys show aerosol paint sales have been growing at the rate of 50% a year for the past several years. Growth will continue steady and rapid according to Mr. Herbert D. Fine, president of Plasti-Kote, Inc., Cleveland, Ohio, who estimates a 250,000,000 can market by 1970. He reports sales of aerosol paints still represent a small percentage of the entire market; however, he notes that the spray can is not intended to replace the 5-gallon conventional paint can. Mr. Fine predicts that by 1961 paint will be the number one best selling non-food aerosol product on the market.

An estimate by the National Paint, Varnish, and Lacquer Association reports that 160,000,000 gallons of paint are sold yearly to retail buyers for their own home use. In addition, aerosol paint products consumed approximately 4,000,000 gallons of paint in 1958. The aerosol paints represent only about 2½% of the total market. It is believed that aerosol paints will replace at least 90% of all conventional paints in sizes from quarts, pints and half-pints.

According to a recent survey conducted for Plasti-Kote, only 20% of the public is aware that paint is available in aerosol pressurized cans, and of those who have used paint in aerosol form, it is preferred to conventional painting three-to-one.

Indicative of the growing trend is the case of Plasti-Kote, which threw its conventional paint can business out the window in 1954 to concentrate on paint in aerosol containers. Its daily capacity of 6,000 cans 5 years ago has jumped to a production capacity of 76,000 cans daily, with anticipated sales this year of over 10,000,000 units.

The company now produces 2400 different colors and products, including 350 colors to match major car paints from the years 1957 to 1959. Other special colors are packaged for industrial firms in match colors to standard equipment that becomes damaged in transit or upon installation. Most major manufacturers today supply aerosol paint cans with machinery, office furniture, storm windows, etc., thus eliminating an old source of customer dissatisfaction.

Mr. Fine states that the recent market studies show the biggest increase in aerosol paint volume is coming from new decorator colors that are attracting women to paint everything from picture frames and lamp bases to shoes and handbags.

More and more sales of aerosol paints are going through the drug store and super market outlets. Aerosol paints lend themselves to easy mass distribution through volume outlets because they are sold usually in one size only and are easily displayed and marked for impulse selling.

•

Representative Appointed

Southwest Sales Company, Inc., Dallas, Texas, has been appointed sales representative for a recently expanded line of Morehouse Mills and Cowles Dissolvers in Northern Texas, it has been announced.

Southwest Sales Company's main offices are at 2400 Coombs Street, Dallas, where the company maintains warehouse and liquid storage facilities.

•

Heyden Newport Venture

Heyden Newport Chemical Corp. has announced the formation of a new company for the production of gum rosin in Mexico.

The new company, Resinera del Tigre, S. de R. L. de C. V., is a collaboration of Heyden Newport and Resinera Uruapan, S. A., according to a statement by Simon Askin, the U. S. firm's president and Ramon Martin del Campo, head of the Mexican participant. Resinera Uruapan, S. A. (RUSA) is one of Mexico's largest naval stores producers.

The new venture in Mexico now gives Heyden Newport a stake in all three fundamental types of naval stores. These include gum rosin, wood naval stores, and tall oil products.

The Mexican acquisition will be Heyden Newport's fifth naval stores producing facility. The firm's other naval stores plants are at Pensacola, Fla.; Telogia, Fla.; Oakdale, La.; and Bay Minette, Ala.

SYMPOSIUM: The Technical Education Committee of the Cleveland Paint and Varnish Production Club considering plans for the Symposium on Viscosity to be held in Cleveland early in September. Left to right: Dr. George Selden, Eric S. Wormser, Harold L. Jaffe, Dr. John C. Weaver, and Robert M. Evans.

NEWS

New ASTM National Officers are Elected

The new national officers for the American Society for Testing Materials for 1959-60 were elected at the 62nd Annual Meeting held recently in Atlantic City, N. J.

F. L. LaQue, vice-president and manager, Development and Research Division, The International Nickel Co., has been elected president. Miles N. Clair, president, The Thompson & Lichtner Co., has been elected vice-president. A. Allan Bates, vice-president of Research and Development, Portland Cement Association, will continue as senior vice-president.

Elected for three-year terms on the Board of Directors were the following: A. B. Cornthwaite, engineer of materials and tests, Department of Highways, Commonwealth of Virginia; C. L. Kent, assistant director of technical services, The Jones & Laughlin Steel Corporation; H. C. Miller, laboratory engineer in charge of the testing laboratory, Public Service Electric and Gas Co. (N. J.); C. F. Nixon, head, electrochemistry and polymers dept., Research Laboratories, General Motors Corporation; H. D. Wilde, Research coordinator, Humble Oil & Refining Co.; and I. V. Williams, materials engineer, Bell Telephone Laboratories.

Elected for a two-year term, in accordance with a change in the Society's by-laws, is Robert D. Thompson, chief development engineer for Commercial and Glass Products, Taylor Instrument Companies.

•

Colton Purchases Hope

Purchase of the Hope Machine Co. by the Arthur Colton Co. has been announced.

Colton has purchased all Hope inventory stocks and will service all Hope machines now in the field. The Hope machines will be merchandised under the name of "Colton-Hope."

CONFERENCE: Session for Sherwin-Williams Co. plant superintendents at Dallas brought these men together in the Garland plant of the company: Left to Right: Victor Mills, general manager of paint, varnish and lacquer manufacturing; Clarence Callaby, deputy managing director of Lewis-Berger & Sons, Ltd., Sidney Australia; Frank Armitage, group technical development officer for the same firm in London, England; W. A. Miller, general manager of Chicago operations; J. S. Prescott, superintendent of plant and equipment; Aaron Barkman, superintendent of paint manufacturing, Chicago; and W. R. Currens, general superintendent, Garland-Dallas plant. Among topics discussed at this annual three-day conference were recent advances in manufacturing techniques, plant safety, and production quality control.

Canco Canadian Coils

The Canadian metal can industry's first coil-processing center is under construction in Hamilton, Ontario as part of a $5,000,000 expansion program of American Can Company of Canada, Ltd.

G. H. McVean, vice president in charge of Canadian operations, said that "a new plant containing more than 200,000 square feet of floor area will house high-speed automatic machinery that will shear, inspect, sort and stack virtually all the tin plate used in our five Canadian container plants."

The new and expanded operations are scheduled for full commercial production late this year and will provide employment for an additional 275 people.

•

Chemical Service

A new chemical intelligence service is now available from the Cheminform Institute, 10 Columbus Circle, New York, N. Y.

This service covers not only technical words but trademarks and common and generic names used in the U. S. A. and all foreign industrialized countries.

H. Bennett, editor-in-chief of the Chemical Formulary, is the director of this institute.

•

Campbell Named to Post

Douglas E. Campbell was appointed secretary-treasurer of the Pulp Chemicals Association at a recent meeting of the Executive Committee of the Association.

The Pulp Chemicals Association was formed in 1955 as a trade association of manufacturers of chemical products produced by or derived from the sulphate wood pulping industry. The Association includes two divisions: the Tall Oil Products Division with fifteen members concerned with the problems of crude, refined and distilled tall oils as well as tall oil fatty acids, and the Sulphate Turpentine Division with thirteen members representing producers of sulphate turpentine.

Mr. Campbell has broad experience in the chemical industry. He has worked with the Manufacturing Chemists' Association as assistant to the secretary, National Aniline Division, Allied Chemical Corp., and Merck & Co., Inc.

NEWS

Reichhold Names Supplier

Carlstadt Leather Finishing Co., Carlstadt, N. J., will be exclusive supplier of Reichhold Chemicals, Inc., "Synthemul" acrylic emulsions to the leather industry in the mid-Atlantic and New England States, it has been announced.

The agreement provides an addition to Carlstadt's line of leather finishing products, which include clear and pigmented nitrocellulose lacquers, clear and pigmented "Aqua-Tones", resin finishes, and other leather coating materials. The agreement is also expected to result in improved servicing of leather industry customers for Synthemul emulsions.

The Synthemuls—actually a wide range of acrylic emulsions also used in the paint, floor polish, paper and textile fields—are used in the finishing of all types of leather. They may be used as a base coat, surface coating or as a binder for the leather fibers. The fact that they may be used in combination with various coloring agents and are water-resistant, makes possible the gaily colored leather wearing apparel now finding favor with fashionable young ladies.

•

Company Name Change

Carbic Color & Chemical Company, Inc., has announced that as of July 1, the name of the company is Carbic-Hoechst Corp.

Carbic-Hoechst Corp., will have a Dyestuff Division and a Pigment Division. The headquarters of the Dyestuff Division will continue to be at its present location, 451 Washington Street, New York 13, N. Y. The headquarters of the Pigment Division will be located in West Warwick, R. I.

•

Edwards Wins Award

Ralph Wechsler, president of the Nopco Chemical Company, has announced David Mitchell Edwards, Cedartown, Ga., as winner of the Charles P. Gulick Scholarship for 1959.

Established in 1956, the Gulick Scholarship is a tribute to the memory of Nopco's founder, Charles P. Gulick, who died in 1955.

Awarded annually to the son or daughter of a Nopco employee, the Scholarship provides the winner $750 per year for four years at any accredited college of the recipient's choice. The winner is selected on the basis of scholastic achievement, financial need, character, and all-round personality.

Badger Awarded Contract

Badger Manufacturing Co., Cambridge, Mass., has been awarded a contract for the design, engineering and construction of a tall oil distillation plant, rosin treating unit and offsite facilities by Arizona Chemical Co.

The plant, which will have a throughput of 120 tons per day of crude tall oil, will be constructed adjacent to the International Paper Company plant in Springhill, La.

Dewey and Almy Opens New Plant

Start-up of a new plant at Owensboro, Ky., to manufacture polyvinyl acetate polymers and copolymers, butadiene styrene synthetic rubber latices, and battery separators has been announced by the Dewey and Almy Chemical Division, W. R. Grace & Co.

The $4,000,000 facility, Dewey and Almy's 15th plant and its seventh in North America, went on stream in the Dewey and Almy Division's 40th anniversary year and month. The division was incorporated June 12, 1919.

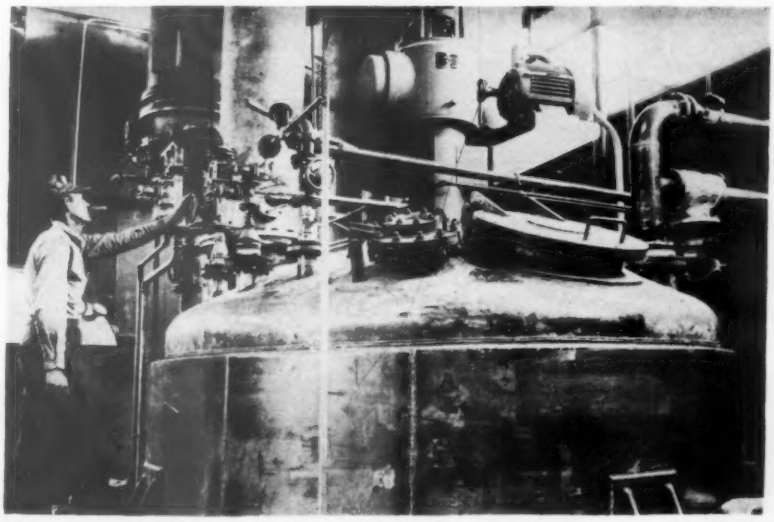
The Owensboro plant doubles Dewey and Almy's total capacity to produce polyvinyl acetate emulsions and butadiene styrene latex, used by the paint, paper, adhesives, textile, rubber, and plastic industries. Total latex and vinyl emulsion capacity at Owensboro is 20,000,000 pounds a year. The plant hikes by 30% capacity for resin-impregnated fiber separators for the storage battery industry.

For all three lines of products, the new plant is located in the heart of large Midwest and Southern marketing areas; it is within overnight trucking distance of such centers as Chicago, Atlanta, and Kansas City.

The battery separator section is making deliveries, and the polymerization plant is now in the start-up period.

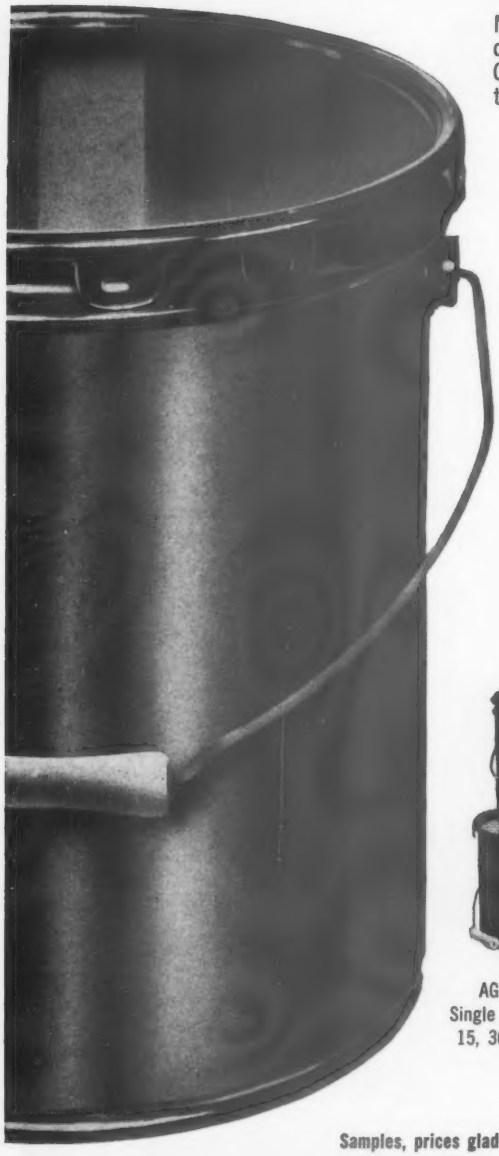
The plant manager during construction and start-up is James F. Murphy, Dewey and Almy's assistant chief engineer. He is now training his replacement, Harry R. Marty, who was formerly manager of process development in the Organic Chemicals Division.

Assistant plant manager in charge of organic chemicals manufacturing is Craig E. Falk. Assistant plant manager in charge of battery separator manufacturing is Arthur L. Fisher.



Close-up of butadiene-styrene reactor showing some of the control mechanisms which govern the manufacturing process of rubber latex compounds. The reactor is a huge pressure cooker which combines two ingredients to form a new material with properties different from the original two.

PAILS and DRUMS for the PAINT TRADE



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15, 30, 55 gallon sizes

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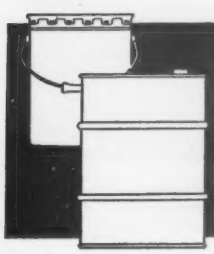

VULCAN STEEL CONTAINER CO.

Main Office and Factory

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ISOPHTHALIC

(*From page 34*)

temperature of 515-520°F and held there for half an hour, then the polyol is added and the cook proceeds normally. As an alternative, the polyol may be added as soon as the acidolysis temperature is reached. In this latter case, the polyol should be added gradually over a period of half an hour to an hour. Since no catalyst is used during the process, the resulting resin will be bright.

Properties and Applications

Isophthalic modified oils are being used as house paint vehicle. The resulting finish shows faster drying, better gloss and color retention, and improved durability. The use of isophthalic in such a vehicle has helped overcome the shortcomings of orthophthalic vehicle (poor brushability, lack of adhesion and poor blister resistance).

In trade sales applications, isophthalic alkyds make very good vehicles for interior and exterior enamels; their main advantages are flexibility, good gloss and color retention.

In the medium oil length range, isophthalic alkyds are characterized by their speed of tack-free-dry, their good adhesion to various substrates, their good chemical resistance and gloss retention. They make excellent vehicles for automotive refinishing enamels and for implement enamels.

In the short oil baking vehicle, isophthalic imparts to the coating, adhesion, hardness, flexibility and toughness. Excellent isophthalic resins have been formulated which more than meet the stringent specifications of appliance finishes.

In maintenance paints, there are two applications where isophthalic resins show great promise. For several years, to cut down on the labor involved in repainting storage tanks for oil and chemicals, maintenance people have been using quite successfully a type of paint known as multi-mil paint. The object is to coat the metal with 8 to 12 mil of dry film in one or two applications. This, not only cuts the labor bill, but also gives protection for 10 to 15 years. Isophthalic based vehicles give to this type of finish better adhesion to substrates and between coats, and better chemical resistance.

In the recent months, the use of polyesters for anticorrosive coatings is becoming more and more widespread. Among other advantages, a polyester coating is a one hundred per cent coating (no solvent loss) and it can be reinforced wherever corrosion threatens to weaken the substrate. Isophthalic polyesters show great improvement because of their excellent wetting properties, their outstanding adhesion and good chemical resistance.

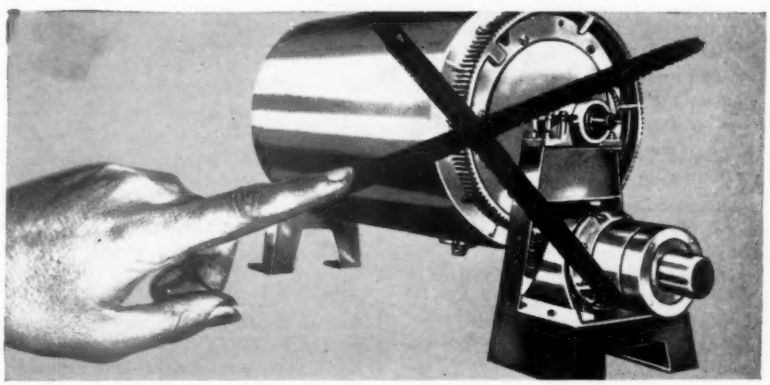
In conclusion, we like to leave two ideas with you. First isophthalic, a very versatile dibasic acid, will contribute more and more to improve protective coatings. To obtain optimum properties, it should not be replaced on a mole basis in existing orthophthalic formulations, even though it is an isomer of the same acid.

•

Konen Awarded Degree

James C. Konen, vice president in charge of research for Archer-Daniels-Midland Company, was awarded a doctor of science degree by North Dakota State College at commencement ceremonies.

Mr. Konen, who delivered the commencement address to the graduating class, received a bachelor. of science degree at North Dakota State in 1933 and his master's degree in organic chemistry in 1935.



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OUTSTANDING FEATURES

- Slower sedimentation rate
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PERSONNEL CHANGES

BLAW-KNOX

Armin Jensen has been promoted to the position of technical service representative for the solvent extraction industry, it has been announced.

A. Jensen

In his new capacity, Mr. Jensen will serve as consultant and advisor to clients and prospective clients on problems associated with equipment selection, production methods, and system performance.

Mr. Jensen brings to his new position wide and varied experience in the solvent extraction field, having been associated with fats and oil work in many foreign countries as well as the United States. He joined the firm in 1943 as process and field engineer.

AMERICAN CYANAMID

R. C. Sarfaty has been appointed assistant manager of advertising for the company's industrial chemicals division, it has been announced.

Mr. Sarfaty, who joined the firm in 1945, has held a variety of sales and administrative posts, most recently serving as a sales representative for the process chemicals department in the New England area.

A graduate of Princeton University with a bachelor of arts degree, he has also received a masters degree in marketing from New York University.

PENNSALT CHEMICALS

C. Brooks Ricca has been named sales manager for isotron propellents, it has been announced.

Formerly district sales manager for metal processing chemicals, Mr. Ricca will direct all sales activities for isotron propellents throughout the U. S.

Mr. Ricca, who joined the firm as a metal processing chemicals salesman in 1950, has been metal processing district sales manager for the Eastern seaboard from Maine to Virginia for the past three years.

He holds a B. S. degree in mechanical engineering from Villanova University.

VULCAN CONTAINER

David W. Lynch has been named sales-service representative, with headquarters in Birmingham, it has been announced.

D. W. Lynch

Mr. Lynch has been active for the past twenty years in the sale of basic insecticides and chemicals to the pesticide and sanitary supply industries. His wide acquaintance in this and other similar fields is said to give him a diversified background of experience to provide a complete and reliable steel packaging service.

John J. Redmon has been appointed regional sales manager, it has also been announced.

Mr. Redmon attended the Southeastern State College and the University of Colorado Law School. He has had a wide specialized experience in the container field and is well known among container users throughout the South.

Mr. Redmon will make his headquarters in Dallas and cover the Southwestern states.

CALENDAR

Aug. 10-14. 1959 Short Course on Drying Oils, Sponsored by the American Chemist's Society and the University of Minnesota Institute of Tech., Minneapolis, Minn.

Sept. 10-12. Symposium on Viscosity, Cleveland Paint Groups & Case Institute of Technology, Case Inst., Cleveland, Ohio.

Sept. 13-18. 136th National Meeting, American Chemical Society, Atlantic City, N. J.

PRODUCTION CLUB MEETINGS

(no summer meetings)

Baltimore, 2nd Friday, Park Plaza Hotel.
Chicago, 1st Monday, Furniture Mart.
C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Hotel Alms.
Dayton — Nov., Feb., April, Suttmilers.
Columbus — Jan., June, Sept., Fort Haves Hotel.
Cleveland, 3rd Friday, Cleveland Engineering & Scientific Center.
Dallas, 1st Thursday after 2nd Monday, Melrose Hotel.
Detroit, 4th Tuesday, Rackham Building.
Golden Gate, 3rd Monday, Sabella's Restaurant, San Francisco.
Houston, Monday prior 2nd Tuesday, Rams Club.
Kansas City, 2nd Thursday, Pickwick Hotel.
Los Angeles, 2nd Wednesday, Scully's Cafe.
Louisville, 3rd Wednesday, Seelbach Hotel.
Montreal, 1st Wednesday, Queen's Hotel.
New England, 3rd Thursday, University Club, Boston.
New York, 1st Thursday, Brass Rail, 100 Park Ave.
Northwestern, 1st Friday, St. Paul Town and Country Club.
Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.
Philadelphia, 3rd Wednesday, Philadelphia Rifle Club.
Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.
Rocky Mountain, 2nd Monday, Republican Club, Denver, Colo.
St. Louis, 3rd Tuesday, Kings-Way Hotel.
Southern, Annual Meetings Only.
Toronto, 3rd Monday, Oak Room, Union Station.
Western New York, 1st Monday, 40-8 Club, Buffalo.

PITTSBURGH PLATE

William B. Calhoun, Jr. has become manager of automotive sales for the company's Ditzler Color Division in Detroit, it has been announced.

W. B. Calhoun, JR.

Prior to his appointment, Mr. Calhoun had served as manager of industrial sales for the Houston, Texas, paint factory. Mr. Calhoun joined the company in 1935 as a sales trainee at the Milwaukee Paint Division where he also served as manager of industrial sales service.

Mr. Calhoun was graduated from the University of Wisconsin with a Bachelor of Arts degree.

DOW

Charles M. Doscher, head of chemicals sales for the company's New York office since 1956, has been promoted to the newly created position of sales manager of chemicals for the international companies, it has been announced.

Frank H. Sellars, of the Atlanta office, has been advanced to succeed Mr. Doscher at New York. Mr. Sellars has headed chemicals sales at Atlanta since 1956.

Mr. Doscher joined the firm in 1949 following his graduation from Fordham University with a B. S. degree in chemistry. He has been associated with general chemicals sales for the New York office nine years and spent more than a year at Midland headquarters specializing in ethylene glycol antifreeze sales.

Mr. Sellars started his career with the company in 1943 as a member of the magnesium sales group in Philadelphia. He has handled general chemicals sales since 1948, the last nine years with the Atlanta office. He was educated at the U. S. Coast Guard Academy, class of 1932.

HEYDEN NEWPORT

The following personnel changes have been announced:

Dr. T. R. Aalto has been appointed product sales manager, fine chemicals; **E. L. Barkley,** product sales manager, synthetic resin chemicals; and **T. H. Risch,** product sales manager, organic intermediate chemicals.

Each man will be responsible for developing sales programs and strategy to capitalize on sales opportunities.

FERRO

Donald E. Adam has been appointed plant chemical engineer, it has been announced.

Mr. Adam received his B. S. degree in chemical engineering with honors at Syracuse University in 1955, and was with the Allis-Chalmers Company in West Allis, Wisc., before joining the firm.

CALIFORNIA INK

The following personnel changes have been announced:

Bart Thibadeau has been appointed sales representative in the San Francisco Bay area; **Steve Brown** has been named administrative assistant to the manager of the raw materials division; **A. J. Passonno** has become a sales agent for the states of Alabama, Mississippi, Louisiana, and Florida; and **Richard P. Weber** has been appointed to head the customer service organization for the paint industry.

BENJAMIN MOORE

Robert W. Jones has been named assistant to the vice president in charge of sales, it has been announced.

Mr. Jones joined the company's sales staff in 1929. Subsequently he was named assistant sales manager and then general sales manager of the Chicago branch. He will continue to headquarter in Chicago where marketing procedures will be his chief responsibility.

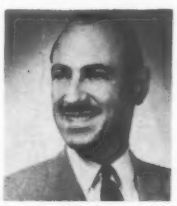
Mr. Jones will be replaced by **Frederick B. Battle** who has been promoted to general sales manager of the Chicago branch. Mr. Battle has been associated with the organization since 1949 as sales representative and more recently as assistant sales manager of the Chicago branch.

William O. Wagner has been appointed assistant general manager of the St. Louis branch, it has also been announced.

In this position Mr. Wagner will assist in the management of both the St. Louis and Houston plants.

MARBON CHEMICAL

Kenneth A. Erwin has been appointed administrative manager of the research and development department, it has been announced.



K. A. Erwin

Mr. Erwin holds a B. S. degree in chemistry from Norwich University and an M. B. A. degree from the University of Louisville.

For the past eleven years he has been associated with the General Electric Company, serving in laboratory, administrative and engineering capacities. His principal work has been with plastics and their application in major appliances.

He has been a national director of the Society of Plastics Engineers.

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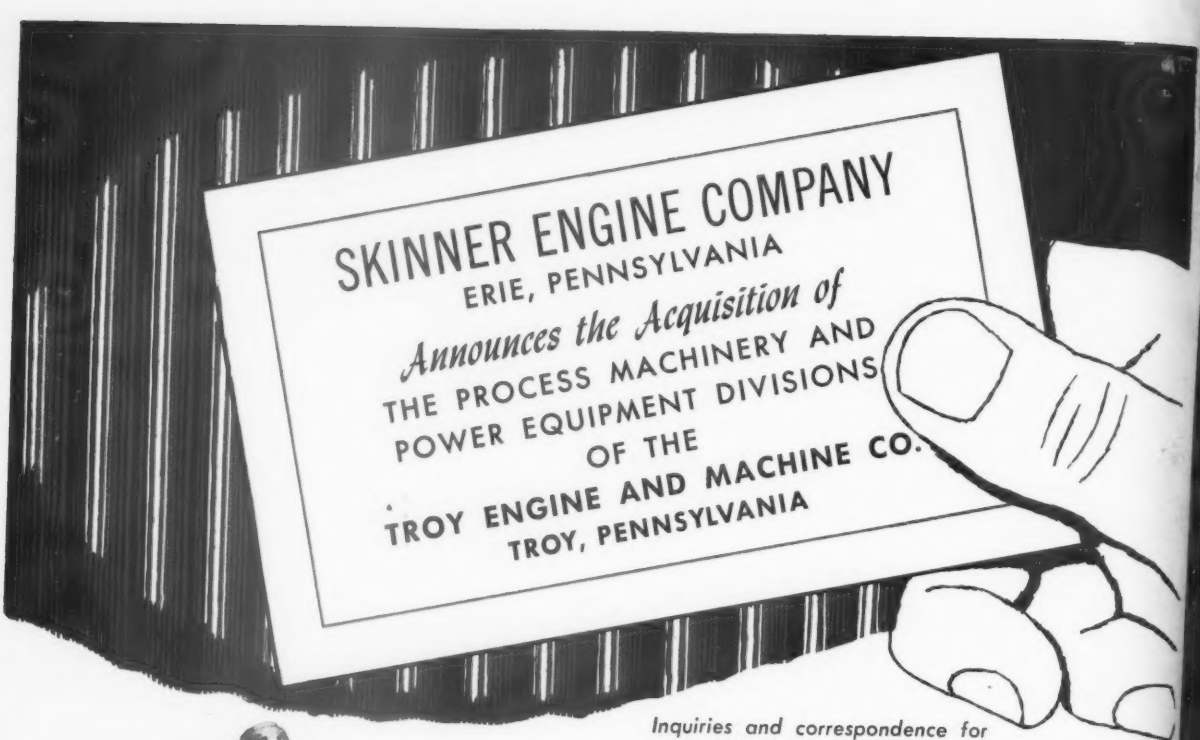
Midwest Paint and Varnish manufacturer seeks plant-production executive who is able to assume full responsibility for factory operation. Background of technical, laboratory, production experience essential. Compensation open. All replies confidential. Reply Box 859.

ARCHER-DANIELS-MIDLAND

Gerald Skidmore has joined the sales department of the company's isolated soy protein operation at Evendale, Ohio, it has been announced.

For the past year, Mr. Skidmore has been enrolled in a technical training program at the research center.

A graduate of Purdue university with a bachelor's degree in chemical engineering, Mr. Skidmore also holds a master's degree from Cornell University's school of business adminstration.



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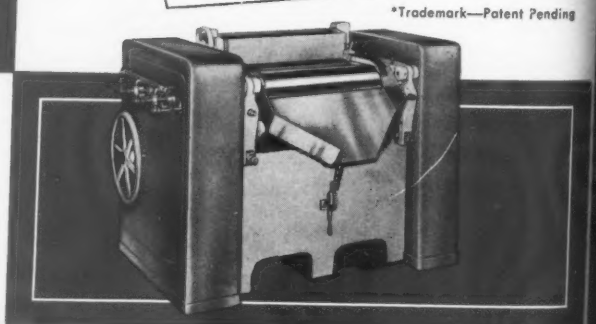

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